

Project Title: **ISB Injection System**
Section Title: **Steel Doors and Frames**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 08110--STEEL DOORS AND FRAMES

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Section Includes: Work includes, but is not limited to, furnishing and installing the following:

- 8
9 Exterior steel doors for metal building systems
10 Interior steel doors and frames
11 Glass and glazing for steel doors
12 Glazing frames for steel doors
13 Louvers and frames for steel doors.
14

15 Related Sections: The following sections contain requirements that relate to the work of this section:

- 16
17 Section 08700, "Door Hardware," for door hardware and weather stripping
18 Section 09900, "Painting," for field painting primed doors and frames
19 Section 13120, "Metal Building Systems," for exterior door frames in metal building systems.
20

21 REFERENCES:

22
23 The following documents, including others referenced therein, form part of this section to the extent
24 designated herein:

25
26 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- 27
28 ANSI A115 "Specifications for Steel Door and Frame Preparation for Hardware"
29 ANSI A224.1 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for
30 Steel Doors and Frames"
31 ANSI A250.4 "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors
32 and Hardware Reinforcement"
33 ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames"
34 ANSI Y14.1 "Drawing Size and Format"
35

36 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- 37
38 ASTM A153 "Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware"
39 ASTM A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron
40 Alloy-Coated (Galvannealed) by the Hot-Dip Process"
41 ASTM A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip
42 Galvanized Coatings"
43 ASTM A1008 "Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-
44 Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
45 ASTM A1011 "Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
46 Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with
47 Improved Formability"
48 ASTM C1036 "Standard Specification for Flat Glass"

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1 ASTM C1363 “Standard Test Method for the Thermal Performance of Building Assemblies by
2 Means of a Hot Box Apparatus”
3 ASTM E774 “Standard Specification for the Classification of the Durability of Sealed
4 Insulating Glass Units”
5

6 CODE OF FEDERAL REGULATIONS (CFR)
7

8 16 CFR 1201 “Safety Standard for Architectural Glazing Materials”
9

10 DOOR AND HARDWARE INSTITUTE
11

12 DHI “Recommended Locations for Architectural Hardware for Standard Steel Doors
13 and Frames”
14

15 INSULATING GLASS CERTIFICATION COUNCIL (IGCC)
16

17 *Certified Products Directory—Sealed Insulating Glass*
18

19 NATIONAL CERTIFIED TESTING LABORATORIES (NCTL)
20

21 STEEL DOOR INSTITUTE (SDI)
22

23 SDI 100 “Recommended Specifications for Standard Steel Doors and Frames”
24 SDI 105 “Recommended Erection Instructions for Steel Frames”
25 SDI 107 “Hardware on Steel Doors”
26 SDI 112 “Galvanized Standard Steel Doors and Frames”
27 SDI 117 “Manufacturing Tolerances Standard Steel Doors and Frames”
28

29 STEEL STRUCTURES PAINTING COUNCIL (SSPC)
30

31 SSPC-PA 1 “Paint Application Specification No. 1”
32 SSPC-Paint 20 “Zinc-Rich Primers”
33 SSPC-SP 1 “Solvent Cleaning”
34 SSPC-SP 5 “White Metal Blast Cleaning”
35 SSPC-SP 8 “Pickling”
36

37 UNDERWRITER’S LABORATORIES (UL)
38

39 FACTORY MUTUAL (FM)
40

41 GLAZING DEFINITIONS:
42

43 Glass: “Glass” includes prime glass, processed glass, and fabricated glass products.
44

45 Glazing: “Glazing” includes glass installation and materials used to install glass in steel doors.
46

47 Deterioration of Insulated Glass: Defects developed from normal use that are attributable to the
48 manufacturing process and not to cause other than glass breakage and practices for maintaining and

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1 cleaning coated glass contrary to the manufacturer's written instructions. Defects include obstruction of
2 vision by dust, moisture, or film on interior surfaces of glass.

3
4 GLAZING SYSTEM DESCRIPTION:

5
6 General: Provide glazing systems for steel doors that are produced, fabricated, and installed to withstand
7 normal thermal movement, wind loading and impact loading (where applicable) without failure, including
8 glass breakage, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing
9 materials, and any other defects in construction.

10
11 SUBMITTALS:

12
13 Submittals for Review:

14
15 General: Submit copies of indicated items for final review and approval prior to construction start, unless
16 otherwise indicated.

17
18 Product Data: Submit product data for each type of door and frame specified, including details of
19 construction, materials, dimensions, hardware preparation, core, glass and glazing products, louvers,
20 louver and glazing frames, thermal ratings, profiles, and finishes.

21
22 Shop Drawings: Submit black-line printed, CAD-generated shop drawings of size and drawing standard
23 complying with ANSI Y14.1, complete and accompanied by technical and performance data as necessary
24 to fully illustrate fabrication and installation of door, frames, and glazing. Include details of each frame
25 type, elevation of door design types, conditions of openings, details of construction, location and
26 installation requirements of door and frame hardware and reinforcements, and details of joints and
27 connections. Show anchorage and accessory items.

28
29 Door Schedule: Submit schedule of doors and frames using same reference numbers for door details and
30 openings as those on subcontract drawings. Indicate coordination of glazing frames and stops with glass
31 and glazing requirements.

32
33 Samples for Initial Selection: Submit manufacturer's color charts showing full range of colors available
34 for factory-finished doors and frames prior to purchase.

35
36 Samples for Verification: Submit samples for each type of exposed finish required, prepared on samples
37 not less than 3 by 5 in. of same thickness and material indicated for final unit of work.

38
39 Submittals for Information: None.

40
41 Submittals for Project Closeout:

42
43 Glazing Certificates: Submit copies of product certificates signed by the glazing material manufacturer's
44 authorized representative certifying that their products comply with the requirements of these
45 specifications. Separate certifications are not required for glazing materials bearing manufacturer's
46 permanent labels designating type and thickness of glass, provided labels represent a quality control
47 program of a recognized certification agency or independent testing agency acceptable to authorities
48 having jurisdiction. Submit certificates before final acceptance for approval by the Contractor's
49 Construction Manager.

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1 Warranties: Submit copies of special warranties specified in this section before final acceptance for
2 approval by the Contractor's Construction Manager.

3
4 QUALITY CONTROL:

5
6 Provide doors and frames complying with ANSI/SDI 100, "Recommended Specifications for Standard
7 Steel Doors and Frames," and as specified.

8
9 Single-Source Responsibility: Provide glass for steel doors and frames from one source for each type of
10 glass product, where possible. Provide glazing accessories from one source for each product and
11 installation method.

12
13 DELIVERY, STORAGE, AND HANDLING:

14
15 Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job
16 storage. Provide additional protection for factory-finished doors.

17
18 Inspect doors and frames upon delivery for damage. Minor damages may be repaired, provided finished
19 items are equal in all respects to new work and acceptable to the Contractor; otherwise, remove and
20 replace damaged items as directed.

21
22 Store doors and frames under cover, placed on minimum 4-in.-high wood blocking. Avoid creating
23 nonvented humidity shelters. If cardboard wrappers become wet, remove cartons immediately. Provide
24 minimum 1/4-in. spaces between stacked doors.

25
26 Handle glazing materials and glass to comply with manufacturer's instructions and as needed to prevent
27 damage to glass and glazing materials from condensation, temperature changes, direct exposure to
28 sunlight, or other causes.

29
30 Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass
31 fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

32
33 SITE CONDITIONS:

34
35 Environmental Conditions: Comply with glass manufacturer's recommendations for installation
36 temperatures. Do not install when glazing substrates are wet from rain, frost, condensation, or other
37 causes.

38
39 GLASS AND GLAZING WARRANTY:

40
41 General Warranty: Special warranties specified in this section shall not deprive the owner of other rights
42 the owner may have under other provisions of the Contract Documents.

43
44 Manufacturer's Special Warranty on Glass Products Installed in Steel Doors: Written warranty agreeing
45 to furnish replacements for glass units that deteriorate as defined in the "Definitions" article, f.o.b. the
46 nearest shipping point to the project site, within the specified warranty period of 5 years from the date of
47 Substantial Completion.

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1 PART 2--PRODUCTS

2
3 MANUFACTURERS:

4
5 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that
6 may be incorporated in the work include, but are not limited to, the following:

7
8 Steel Doors and Frames:

9
10 AMWELD Building Products Div.
11 Ceco Corp.
12 Curries
13 Fenestra
14 Republic Builders Products Corp.
15 Steelcraft Mfg. Co.

16
17 Glass and Glazing:

18
19 AFG Industries
20 Artistic Glass Products Co.
21 Cardinal IG
22 Saint-Cobain
23 Falconer Glass Industries
24 Glasstemp, Inc.
25 Guardian Industries Corp.
26 HGP Industries
27 PPG Industries, Inc.
28 Spectrum Glass Products, Inc.
29 Tempglass
30 Viracon, Inc.
31 Ashai Glass Co.
32 Central Glass Co., Ltd.
33 Nippon Sheet Glass, Ltd.
34 Pilkington Sales, Ltd.

35
36 MATERIALS:

37
38 Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with
39 ASTM A 569.

40
41 Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366, or
42 ASTM A 620, drawing quality, special killed.

43
44 Galvanized Steel Sheets: Zinc-coated carbon steel sheets complying with ASTM A 526, commercial
45 quality, or ASTM A1011, "Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
46 Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability,"
47 commercial quality, with A60 or G60 coating designation, mill phosphatized.

48
49 Supports and Anchors: Fabricate of not less than 18-gauge galvanized sheet steel.

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1 Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built
2 into exterior walls complying with ASTM A153, "Standard Specification for Zinc Coating (Hot Dip) on
3 Iron and Steel Hardware," Class C or D, as applicable.

4
5 GLASS PRODUCTS:

6
7 Clear-Tempered Float Glass: ASTM C1036, "Standard Specification for Flat Glass," Type I (transparent
8 glass, flat), Quality q3 (glazing select), Class 1 (clear), Condition A (uncoated), Kind FT (fully tempered),
9 with 1/4-in. thickness.

10
11 Clear-Tempered Insulating Glass: ASTM E774, "Standard Specification for the Classification of the
12 Durability of Sealed Insulating Glass Units," Class CBA preassembled units consisting of organically
13 dual-sealed lites of glass separated by dehydrated air spaces. Provide sealed lites complying with
14 ASTM E774, Type I (transparent glass, flat), Quality q3 (glazing select); Class 1 (clear); Kind FT (fully
15 tempered); Condition A (uncoated); with overall thickness and thickness of each lite of 25 and 6 mm,
16 respectively.

17
18 Glazing Accessories: Provide glazing sealant, tapes, gaskets, and other miscellaneous glazing materials
19 that will provide units that will meet the warranty requirements.

20
21 Glazing Sealant Color: Provide black color for exposed applications.

22
23 DOORS:

24
25 Steel Doors: 1-3/4-in. doors, conforming to ANSI/SDI 100, "Recommended Specifications for Standard
26 Steel Doors and Frames," with manufacturer's standard core, except provide cores in exterior doors with
27 rigid polyurethane cores. Provide exterior doors with top and bottom edges finished flush. Provide doors
28 of materials and ANSI/SDI 100 grades and models specified below or as indicated on drawings and
29 schedules.

30
31 Interior Doors: Unless otherwise indicated, Grade II, heavy duty, Model 2, seamless design, minimum
32 0.0478-in.-thick cold-rolled steel sheet faces.

33
34 Exterior Doors: Unless otherwise indicated, Grade III, extra heavy duty, Model 2, seamless design,
35 minimum 0.0635-in.-thick galvanized steel sheet faces.

36
37 Glazing Frames: Door manufacturer's standard sizes and profiles, including standard preformed seals,
38 fasteners and accessories, for types and conditions indicated.

39
40 Door Louvers: Manufacturer's standard units according to SDI 111C, including fasteners and accessories,
41 for sizes and locations indicated. Provide louvers for interior doors with inverted V-shaped, Y-shaped, or
42 Z-shaped blades or baffles formed of 0.0239-in.-thick cold-rolled steel sheet set into minimum
43 0.0359-in.-thick steel frame. Provide louvers for exterior doors with inverted V-shaped, Y-shaped, or
44 Z-shaped rainproof blades or baffles formed of 0.0279-in.-thick galvanized steel sheet set into minimum
45 0.0396-in.-thick galvanized steel frame, and with galvanized-steel-wire insect screen set in
46 galvanized-steel frame on interior side.

47
48 Hardware: See Section 08700, "Door Hardware."
49

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1 FRAMES:

2
3 Provide metal frames for doors and other openings according to ANSI/SDI 100, "Recommended
4 Specifications for Standard Steel Doors and Frames," and of types and styles as shown on drawings and
5 schedules. Conceal fastenings unless otherwise indicated. Form frames from minimum 0.0478-in.-thick
6 cold-rolled steel sheet, except as otherwise indicated. Fabricate frames with mitered or coped and
7 continuously welded corners. Form exterior frames from 0.0635-in.-thick galvanized steel sheet, except as
8 otherwise indicated.

9
10 Door Silencers: Except on weather-stripped frames, drill stops to receive three silencers on strike jambs of
11 single-swing frames.

12
13 FABRICATION:

14
15 Comply with ANSI/SDI 100, "Recommended Specifications for Standard Steel Doors and Frames,"
16 requirements. Fabricate with clearances not more than 1/8 in. at head and jambs, 1/4 in. at non-fire-rated,
17 pair door meeting stiles, and not more than 3/4 in. at the bottom.

18
19 Clearances: Not more than 1/8 in. at jambs and heads, except not more than 1/4 in. between non-fire-rated
20 pairs of doors. Not more than 3/4 in. at bottom.

21
22 Tolerances: Comply with SDI 117, "Manufacturing Tolerances Standard Steel Doors and Frames,"
23 requirements.

24
25 Galvanized Steel Doors and Frames: Fabricate exterior doors and frames from galvanized steel sheet
26 according to SDI 112, "Galvanized Standard Steel Doors and Frames." Close the top and bottom edges of
27 doors flush as an integral part of door construction or by addition of minimum 0.0635-in.-thick
28 galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top
29 edges of doors against water penetration.

30
31 Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws
32 and bolts.

33
34 Thermal-Rated (Insulating) Assemblies: At all exterior locations, provide doors fabricated as thermal-
35 insulating door and frame assemblies and tested in accordance with ASTM C1363, "Standard Test
36 Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus," on
37 fully operable door assemblies. Unless otherwise indicated, assemblies with maximum apparent U factor
38 for thermal-rated assemblies should be 0.24 Btu/hr (ft²) °F.

39
40 Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish
41 hardware in accordance with final Finish Hardware Schedule and templates provided by hardware
42 supplier. Comply with applicable requirements of SDI 107, "Hardware on Steel Doors," and ANSI A115,
43 "Specifications for Steel Door and Frame Preparation for Hardware," series specifications for door and
44 frame preparation for hardware.

45 For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in
46 top rail of doors or head of frames, as applicable.

47
48 Reinforce doors and frames shall receive surface-applied hardware. Drilling and tapping for surface-
49 applied hardware may be done at the project site.

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1 Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with DHI's
2 "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
3

4 Exterior Doors and Frames for Metal Building Systems: Except as otherwise indicated in this section for
5 exterior steel doors and frames, door frames in exterior walls of metal building systems are specified in
6 Section 13120, "Metal Building Systems."
7

8 Glazing Stops: Minimum 0.0359-in.-thick steel on interior doors and minimum 0.0396-in.-thick
9 galvanized steel on exterior doors. Provide nonremovable stops on outside of exterior doors and on secure
10 side of interior doors for glass and louvers in doors. Provide screw-applied, removable glazing beads on
11 inside of glass and louvers in doors.
12

13 GALVANIZED STEEL SHEET FINISHES:

14
15 Surface Preparation: After fabrication, clean the surfaces with nonpetroleum solvent so that surfaces are
16 free of oil or other contaminants. After cleaning, apply a conversion coating of type suited to the organic
17 coating applied over it. Clean the welds, mechanical connections, and abraded areas, and apply
18 galvanizing repair paint specified below to comply with ASTM A780, "Standard Practice for Repair of
19 Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
20

21 Galvanizing Repair Paint: High zinc-dust content paint for re-galvanizing welds in galvanized steel, with
22 dry film containing not less 94% zinc dust by weight and complying with SSPC-Paint 20, "Zinc-Rich
23 Primers."
24

25 Factory Priming for Field Painting: Where field painting after installation is indicated, apply air-dried
26 shop primer that is compatible with the indicated finish paint system. Apply primer immediately after
27 cleaning and pretreatment.
28

29 STEEL SHEET FINISHES:

30
31 Surface Preparation: After fabrication, solvent-clean surfaces in compliance with SSPC-SP 1, "Solvent
32 Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove the
33 mill scale and rust, if present, to comply with SSPC-SP 5, "White Metal Blast Cleaning," or SSPC-SP 8,
34 "Pickling."
35

36 Pretreatment: Immediately after surface preparation, apply a conversion coating of a type suited to the
37 organic coating applied over it.
38

39 Factory Priming for Field Painting: Apply shop primer that complies with ANSI A224.1, "Test Procedure
40 and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames"; is compatible with
41 finish paint system indicated; and has the capability to provide a sound foundation for field-applied
42 topcoats. Apply primer immediately after surface preparation and pretreatment.
43

44 PART 3--EXECUTION

45 EXAMINATION:

46
47
48 Installer must examine substrate and conditions under which steel doors and frames are to be installed and
49 must notify the Subcontractor of any conditions detrimental to proper and timely completion of work. Do

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1 not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the
2 Installer. Subcontractor shall be responsible for field verification of dimensions.

3
4 **DOOR AND FRAME INSTALLATION:**

5
6 **General:** Install steel doors, frames, and accessories according to shop drawings, manufacturer's data, and
7 as specified.

8
9 **Placing Frames:** Comply with provisions of SDI 105, "Recommended Erection Instructions for Steel
10 Frames," unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced
11 securely until permanent anchors are set. Place frames before constructing enclosing walls and ceilings.
12 After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth
13 and undamaged.

14
15 **In Metal-Stud Partitions:** Install at least three wall anchors per jamb at hinge and strike levels. In steel-
16 stud partitions, attach wall anchors to studs with screws.

17
18 **In Metal Building Systems' Walls:** Except as otherwise indicated in this section, installation of steel doors
19 and frames in exterior walls of metal building systems are specified in Section 13120, "Metal Building
20 Systems."

21
22 **Door Installation:** Fit hollow metal doors accurately in frames, within clearance specified in SDI 100,
23 "Recommended Specifications for Standard Steel Doors and Frames."

24
25 **GLAZING INSTALLATION:**

26
27 **General:** Comply with recommendations of manufacturers of glass, sealants, gaskets and other glazing
28 materials, and of referenced glazing publications.

29
30 **Glass Cleaning and Protection:** Protect exterior glass from breakage immediately after installation by
31 attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface.
32 Remove nonpermanent labels.

33
34 Protect glass from contact with contaminating substances resulting from construction operations,
35 including weld spatter. If, despite such protection, contaminating substances do come into contact with
36 glass, remove them immediately as recommended by the glass manufacturer.

37
38 Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including
39 for natural causes, accidents and vandalism during the construction period. Damaged or broken glass shall
40 be removed from the project site and disposed of offsite.

41
42 Clean glass on both faces not more than 4 days prior to the date scheduled for completion of the project.

43
44 **FIELD QUALITY CONTROL:**

45
46 The Contractor's Representative will perform surveillance to verify compliance of the work to the
47 drawings and specifications.

48

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1 ADJUSTING AND TOUCH UP:

2

3 Prime Coat Touch Up: Immediately after erection, sand smooth any rusted or damaged areas of prime
4 coat and apply touch up of compatible air-drying primer.

5

6 Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from
7 prefinished doors.

8

9 Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames
10 undamaged and in complete and proper operating condition.

11

12 DOOR AND FRAME CLEANING:

13

14 Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with
15 cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

16

17 END OF SECTION 08110

Project Title: **ISB Injection System**
Section Title: **Insulated Overhead Door**
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1 **SECTION 08362--INSULATED OVERHEAD DOOR**

2
3 **PART 1--GENERAL**

4
5 **SUMMARY:**

6
7 **Section Includes:** Work includes, but is not limited to:

8
9 Sectional overhead doors.

10
11 Coordinate the work closely with metal building manufacturer to ensure compatibility and that all backing
12 and framing have been provided. Furnish all necessary inserts and anchoring.

13
14 **Related Sections:** The following sections contain requirements that relate to this section:

15
16 Section 08700, "Door Hardware," for weather stripping installed on insulated sectional overhead
17 doors.

18
19 **REFERENCES:**

20
21 The following documents, including others referenced therein, form part of this section to the extent
22 designated herein:

23
24 **AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)**

25
26 ANSI Y14.1 "Drawing Size and Format"

27
28 **AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

29
30 ASTM C1363 "Standard Test Method for the Thermal Performance of Building Assemblies by
31 Means of a Hot Box Apparatus"

32 ASTM E283 "Standard Test Method for Determining the Rate of Air Leakage Through
33 Exterior Windows, Curtain Walls, and Doors Under Specified Pressure
34 Differences Across the Specimen"

35 ASTM E774 "Standard Specification for the Classification of the Durability of Sealed
36 Insulating Glass Units"

37
38 **GLAZING DEFINITIONS:**

39
40 **Glass:** "Glass" includes prime glass, processed glass, and fabricated glass products installed in overhead
41 sectional doors.

42
43 **Glazing:** "Glazing" includes glass installation and materials used to install glass in overhead sectional
44 doors.

45
46 **Deterioration of Insulated Glass:** Defects developed from normal use that are attributable to the
47 manufacturing process and not to cause other than glass breakage and practices for maintaining and
48 cleaning coated glass contrary to the manufacturer's written instructions. Defects include obstruction of
49 vision by dust, moisture, or film on interior surfaces of glass.

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1 GLAZING SYSTEM DESCRIPTION:
2

3 General: Provide glazing systems for overhead doors that are produced, fabricated, and installed to
4 withstand normal thermal movement, wind loading and impact loading (where applicable) without failure,
5 including glass breakage, failure of sealants or gaskets to remain watertight and airtight, deterioration of
6 glazing materials, and any other defects in construction.
7

8 SUBMITTALS:
9

10 Submittals for Review:
11

12 Product Data: Submit copies of product data, including installation instructions, and indicating
13 compliance with the requirements of this section for approval by the Contractor prior to construction start.
14

15 Shop Drawings: Submit copies of black-line printed, CAD-generated shop drawings of size and drawing
16 standard complying with ANSI Y14.1, "Drawing Size and Format," complete and accompanied by
17 technical and performance data as necessary to fully illustrate fabrication and installation of door, frames,
18 and glazing. Include elevation of door design types, conditions of openings, details of construction,
19 location and installation requirements of door and frame hardware, and details of joints and connections.
20 Show anchorage and accessory items. Submit shop drawings for approval by the Contractor prior to
21 construction start.
22

23 Samples for Initial Selection: Submit copies of manufacturer's color charts showing full range of colors
24 available for factory-finished door panels for approval by the Contractor prior to purchase.
25

26 Glazing Certificates: Submit copies of product certificates signed by the glazing material manufacturer's
27 authorized representative certifying that their products installed in overhead sectional doors comply with
28 the requirements of these specifications. Separate certifications are not required for glazing materials
29 bearing manufacturer's permanent labels designating type and thickness of glass, provided labels
30 represent a quality control program of a recognized certification agency or independent testing agency
31 acceptable to authorities having jurisdiction. Submit glazing certificates for approval by the Contractor
32 prior purchase.
33

34 Submittals for Information: None.
35

36 Submittals for Project Closeout:
37
38

39 Warranties: Submit copies of special warranties specified in this section for approval by the Contractor's
40 Construction Manager before final acceptance.
41

42 QUALITY CONTROL:
43

44 Single-Source Responsibility: Provide the sectional overhead door(s) as complete units produced by one
45 manufacturer—including sections, brackets, guides, tracks, glazing, counterbalance mechanisms,
46 hardware, and operator and installation accessories—to suit openings and head room allowable.
47

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1 WARRANTY:

2
3 General Warranty: Special warranties specified in this section shall not deprive the owner of other rights
4 the owner may have under other provisions of the contract documents.

5
6 Manufacturer's Special Warranty on Glass Products for Overhead Sectional Doors: Written warranty
7 agreeing to furnish replacements for glass units that deteriorate as defined in the "Definitions" article,
8 f.o.b. the nearest shipping point to the project site, within the specified warranty period of 5 years from
9 the date of Substantial Completion.

10
11 PART 2--PRODUCTS

12
13 PRODUCTS:

14
15 Overhead Sectional Doors: The door(s) shall be chain-operated and insulated to provide a minimum
16 "R" value of 14 ("U" 0.070) for the individual panels and a minimum "R" value of 7 ("U" 0.143) for the
17 door(s) in place when tested in accordance with ASTM C1363, "Standard Test Method for the Thermal
18 Performance of Building Assemblies by Means of a Hot Box Apparatus." The sections shall be sandwich
19 construction steel/foam/steel with the insulation foamed in place. The section shall be galvanized sheet
20 steel, a minimum of 0.016 in. thick, with ribbed or fluted face finished as specified hereinafter.

21
22 The door(s) shall be designed to withstand and operate under a 30-psf wind load and 100,000 operating
23 cycles.

24
25 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that
26 may be incorporated in the work include, but are not limited to, the following:

27
28 Overhead Door Company "Thermacore 591"
29 Ceco/Windsor "2001"
30 Kinnear "Climaseal"
31 Wayne-Dalton "Thermospan"
32 Raynor TC-20
33

34 MATERIALS:

35
36 Track Hardware: Tracks shall be 2 in. for doors up to 144 s.f. and/or 16 ft in height, and 3 in. for larger
37 doors. Tracks shall be of galvanized steel and shall be supplied with mounting brackets, fasteners, etc., for
38 a complete installation. Where possible, the track shall provide for high lift operation such that the door in
39 the raised position encroaches on the interior space no more than 6 ft.

40
41 Weather Strip: The door shall be provided with head, jamb, threshold, and joint weather stripping, which
42 will allow a maximum of 0.19 CFM/ft³ of door space at a pressure difference of 0.112 in. H₂O (15 mph
43 wind) when tested in accordance with ASTM E283, "Standard Test Method for Determining the Rate of
44 Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences
45 Across the Specimen."

46
47 Rollers: Provide heavy-duty rollers, with steel ball bearings in casehardened steel races, mounted with
48 varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are

Project Title: **ISB Injection System**
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1 required. Provide roller tires to suit size of track. Use casehardened steel tires for normal installations and
2 neoprene or bronze for hazardous atmospheres.

3
4 Finishes: All sections shall be prefinished on the inside face and outside face. The outside face shall have
5 a baked-on enamel finish. The color shall be white.

6
7 Counter Balancing Mechanism: Pull-rope manual operation by torsion-spring counterbalance mechanism,
8 consisting of adjustable-tension, tempered-steel torsion springs mounted on a cross-header tube or steel
9 shaft. Connect to door with galvanized aircraft-type lift cables. Provide springs calibrated for
10 100,000 cycles minimum. Spring shall have safety cable or other device to restrain springs in case of
11 breakage.

12 13 INSULATING GLASS AND GLAZING:

14
15 General: Provide full-panel glass and glazing units with manufacturer's standard components, including
16 standard insulating-glass overall unit sizes and thickness, standard glass lite thicknesses, intermediate
17 mullions, glazing frames, and accessories. Provide glass and glazing units for locations as shown,
18 complying with requirements specified in this article.

19
20 Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated
21 air interspace and complying with ASTM E774, "Standard Specification for the Classification of the
22 Durability of Sealed Insulating Glass Units," for Class CBA units and with requirements specified in this
23 article.

24
25 Insulating-Glass Sealing System: Dual seal, with manufacturer's standard primary and secondary
26 sealants, and manufacturer's standard spacer materials and construction.

27
28 Indoor/Outdoor Lites: Type I (transparent glass, flat), Quality q3 (glazing select); Class 1 (clear); Kind FT
29 (fully tempered); Condition A (uncoated).

30
31 Glazing Frames and Accessories: Manufacturer's standard framing materials and construction, including
32 elastomeric gasket glazing, frames, glazing sealant, and glazing tapes.

33 34 PART 3--EXECUTION

35 36 INSTALLATION:

37
38 Install door, track, and operating equipment complete with necessary hardware, jamb and head mold
39 stops, anchors, inserts, hanger and equipment supports in accordance with final shop drawings,
40 manufacturer's instructions, and as specified herein. Adjust tension on the springs for the doors, such that
41 they can be moved manually with a force of 10 lb.

42
43 Fasten vertical track assembly to framing at not less than 24-in. o.c. Hang horizontal track from structural
44 overhead framing with angle or channel hangars, welded and bolt-fastened in place. Provide sway
45 bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door operating
46 equipment.

47
48 Upon completion of installation—including work by other trades—lubricate, test and adjust doors to
49 operate easily, free from warp, twist, or distortion and fitting weather tight for entire perimeter.

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1 FIELD QUALITY CONTROL:

2

3 The Contractor's Representative will perform surveillance to verify compliance of the work to the
4 drawings and specifications.

5

6 END OF SECTION 08362

Project Title: **ISB Injection System**
Section Title: **Aluminum Hung Windows**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 08521--ALUMINUM HUNG WINDOWS

2
3 PART 1-GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall supply all labor, equipment, and materials required to construct items listed
8 hereafter and as shown on the drawings.

9
10 Section Includes: Work includes, but not limited to:

11
12 Furnish and install single hung window units as described in the Contract Documents.

13
14 Related Sections:

15
16 Section 13120 – “Metal Building Systems”
17 Section 13121 – “Mezzanine”

18
19 REFERENCES:

20
21 The following documents, including others referenced therein, form part of this section to the extent
22 designated herein.

23
24 AMERICAN NATIONAL STANDARDS INSTITUTE/AMERICAN ARCHITECTURAL
25 MANUFACTURERS ASSOCIATION (ANSI/AAMA)

26
27 ANSI/AAMA 101-93, “Aluminum Prime Windows and Sliding Glass Doors”

28
29 AAMA 1503.1-88, “Voluntary Test Method for Thermal Transmittance and Condensation Resistance of
30 Windows, Doors, and Glazed Wall Sections”

31
32 SYSTEM DESCRIPTION:

33
34 Design Requirements:

35 Comply with minimum test requirements of ANSI/AAMA 101 for classification of specified window in
36 following:

- 37 Air infiltration
- 38 Water Resistance
- 39 Uniform structural load.

40
41 ANSI/AAMA 101 classification DH-C45 minimum for sliding windows, tested at 4 ft wide by 7 ft high
42 minimum.

43
44 Performance Requirements:

45 Meet following thermal performance:

- 46 Condensation Resistance Factor (CRF) of 48 minimum, when tested in accordance with
- 47 AAMA 1503
- 48 Thermal Transmittance of 0.65 maximum, when tested in accordance with AAMA 1503.

Project Title: **ISB Injection System**
Section Title: **Aluminum Hung Windows**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SUBMITTALS:

2
3 Product Data:

- 4 Manufacturer's literature or cut sheet
- 5 Literature on glazing
- 6 Color and finish selection.

7
8 Shop Drawings: Submit prior to framing. Show rough opening requirements. Show proposed jamb
9 extension detail

10
11 Quality Assurance/Quality Control: Manufacturer's published installation instructions.

12
13
14 WARRANTY:

15
16 Provide written non-prorated manufacturer's warranty including:

- 17 10 years for seal failure
- 18 2 years for failure of operating hardware
- 19 2 years on stress cracks related to fabrication or installation problems.

20
21
22 PART 2--PRODUCTS

23
24 MANUFACTURED UNITS:

25
26 Windows:

- 27 Factory glazed
- 28 Weather stripped
- 29 Thermally broken system with poured-in-place and de-bridged structural thermal break
- 30 Outside window surfaces cleanable from inside building
- 31 Finish and color -
 - 32 Meet requirements of AAMA 603.8 for baked-on organic coating
 - 33 Color - white
- 34 Glazing characteristics:
 - 35 Clear interior pane and clear exterior pane with Low E treatment on Surface 2
- 36 Glazing beads - manufacturer's standard.

37
38 ACCESSORIES:

39
40 Anchoring Devices:

- 41 Stainless steel
- 42 Other corrosion-resistant or insulated anchors as specifically approved by Architect in writing prior
43 to use.

44
45 SOURCE QUALITY CONTROL:

46
47 When delivered to project site, windows shall bear permanent label stating model of window and
48 manufacturer's name or AAMA label.

Project Title: **ISB Injection System**
Section Title: **Aluminum Hung Windows**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 PART 3--EXECUTION

2

3 INSTALLATION:

4

5 Review manufacturer's printed installation instructions prior to installing windows.

6

7 Set window frame plumb, level, and in alignment. Secure window properly in opening.

8

9 Apply specified sealant between window frame and building wall. Trim off excess sealant.

10

11 Avoid direct contact between aluminum and adjacent steel work by insulating with materials equal to
12 3M's EC 1202 tape if materials are in pressure contact, or with bituminous paint if pressure between
13 surfaces cannot be maintained.

14

15 Provide redwood extension jambs and drywall wrap for interior treatment. Drywall wrap shall be finished
16 to match drywall finish of lab and office space.

17

18 FIELD QUALITY CONTROL:

19

20 Notify Engineer when windows are to be delivered to project site to allow opportunity for Engineer's
21 inspection prior to installation.

22

23 ADJUSTING:

24

25 After windows are in place, Installer shall adjust hardware and ventilators to operate smoothly and be
26 weather tight when closed.

27

28 CLEANING:

29

30 After installation, clean interior and exterior metal surfaces of windows and accessories of mortar, plaster,
31 paint, and other contaminants. Maintain protection and provide final cleaning.

32

33 END OF SECTION 08521

Project Title: **ISB Injection System**
Section Title: **Door Hardware**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 08700--DOOR HARDWARE

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 This section includes items known commercially as finish or door hardware that are required for swing,
8 sliding, and folding doors, except special types of unique hardware specified in the same sections as the
9 doors and door frames on which they are installed.

10
11 Section Includes: Work includes, but is not limited to furnishing and installing:

12
13 Hinges
14 Lock and latch sets
15 Bolts
16 Closers
17 Miscellaneous door control devices
18 Protection plates
19 Weather stripping for exterior doors
20 Sound and smoke stripping for interior doors
21 Automatic drop seals (door bottoms)
22 Astragals or meeting seals on pairs of doors
23 Thresholds.

24
25 Related Sections: The following sections contain requirements that relate to this section:

26
27 Section 08110, "Steel Doors and Frames," for silencers integral with hollow metal frames and for
28 door and frame reinforcements for surface-mounted hardware
29 Section 13120, "Metal Building Systems"

30
31 Products furnished and installed by the Contractor, which are not part of the work of this section, include:

32
33 Cylinders for locks on entrance doors
34 Final interchangeable cores and keys.

35
36 REFERENCES:

37
38 The following documents, including others referenced therein, form part of this section to the extent
39 designated herein:

40
41 AMERICAN NATIONAL STANDARDS INSTITUTE/BUILDERS HARDWARE
42 MANUFACTURERS ASSOCIATION (ANSI/BHMA)

43
44 ANSI/BHMA A117.1 "Building and Facilities—Providing Accessibility and Usability for
45 Handicapped People"
46 ANSI/BHMA A156.1 "Butts and Hinges"
47 ANSI/BHMA A156.2 "Bored and Preassembled Locks and Latches"
48 ANSI/BHMA A156.4 "Door Controls - Closer"
49 ANSI/BHMA A156.5 "Auxiliary Locks and Associated Products"

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- 1 ANSI/BHMA A156.7 “Template Hinge Dimensions”
- 2 ANSI/BHMA A156.8 “Door Controls - Overhead Holders”
- 3 ANSI/BHMA A156.12 “Interconnected Locks and Latches”
- 4 ANSI/BHMA A156.13 “Mortise Locks and Latches”
- 5 ANSI/BHMA A156.15 “Closer Holder Release Devices”
- 6 ANSI/BHMA A156.16 “Auxiliary Hardware”
- 7 ANSI/BHMA A156.18 “Materials and Finishes”

8

9

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

10

11

ASTM D1056 “Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber”

12

13

14

DOOR AND HARDWARE INSTITUTE (DHI)

15

16

DHI “Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames”

17

18

SUBMITTALS:

19

20

Submittals for Review:

21

22

Product Data: Submit copies of product data from manufacturers for each door hardware product required for approval by the Contractor prior to purchase.

23

24

25

Hardware Schedule: Submit copies of proposed hardware schedule for approval by the Contractor prior to purchase with the following submittal requirements:

26

27

28

Final Hardware Schedule Content: Based on hardware indicated, organize schedule into “hardware sets” indicating complete designations of every item required for each door or opening. Include the following information.

29

30

31

Type, style, function, size, and finish of each hardware item

32

Name and manufacturer of each item

33

Fastenings and other pertinent information

34

Location of each hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule

35

Explanation of all abbreviations, symbols, and codes contained in schedule

36

Mounting locations for hardware

37

Door and frame sizes and materials.

38

39

40

Submittals for Information: None.

41

42

43

Submittals for Project Closeout: None.

44

45

Project Title: **ISB Injection System**
Section Title: **Door Hardware**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 PRODUCT HANDLING:

2
3 Tag each item or package separately with identification related to final hardware schedule, and include
4 basic installation instructions with each item or package.

5
6 Packaging of door hardware is the responsibility of the supplier. As the hardware supplier receives
7 material from various manufacturers, sort and repackage in containers clearly marked with appropriate
8 hardware set number to match set numbers of approved hardware schedule. Two or more identical sets
9 may be packed in the same container.

10
11 Inventory door hardware jointly with representatives of hardware supplier and hardware installer until
12 each is satisfied that count is correct.

13
14 Deliver individually packaged door hardware items promptly to place of installation (shop or project site).

15
16 QUALITY CONTROL:

17
18 Regulatory Requirements (Codes and Standards): Comply with provisions of the following codes and
19 standards, unless otherwise specified herein:

20
21 Americans with Disabilities Act Accessibility Guidelines (ADAAG)

22
23 Single-Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closer, etc.) from
24 a single manufacturer.

25
26 Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in
27 the project's vicinity, that has a record of successful in-service performance for supplying door hardware
28 similar in quantity, type, and quality to that indicated for this project. Require supplier to meet with the
29 Contractor to finalize keying requirements and to obtain final instructions in writing.

30
31 PART 2--PRODUCTS

32
33 MANUFACTURERS: Subject to compliance with requirements, manufacturers offering products that
34 may be incorporated in the work include, but are not limited to, the following:

35
36 Butts and Hinges McKinney Products Co.
37 Stanley Hardware, Div. Stanley Works
38
39 Cylinders and Locks Best Lock Corp.
40 Schlage Lock, Div.
41 Ingersoll-Rand Door Hardware Group
42
43 Bolts Glynn-Johnson Corp.
44 H. B. Ives, A Harrow Company
45 Stanley Hardware, Div. Stanley Works
46
47 Overhead Closer: LCN, Div. Ingersoll-Rand Door Hardware Group
48 Rixson-Firemark, Div. Yale Security Inc.
49

Project Title: **ISB Injection System**
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1	Door Control	Glynn-Johnson Corp.
2	Devices:	H. B. Ives, A Harrow Company
3		
4	Kick, Mop, and	Baldwin Hardware Corp.
5	Armor Plates:	H. B. Ives, A Harrow Company
6		
7	Door Stripping,	Pemko Manufacturing Co., Inc.
8	Seals, Thresholds,	Zero International, Inc.
9	Drop Seals, Sound	
10	Stripping and	
11	Astragals:	

SCHEDULED HARDWARE:

General: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers, as shown in the following: (Products other than those specified will be considered and approved if equal in all respects.)

Manufacturer's Product Designations: Provide either the designated product of the manufacturer indicated for each type of hardware listed or the comparable product of one of the other manufacturers that complies with requirements and is accepted by the Contractor as "or equal" to the designated product. Provide products for each type of hardware complying with referenced quality standards as specified under the Article "Quality Control" in Part 1 and requirements specified elsewhere in this section.

Panic Hardware: Panic hardware shall have forged internal working parts and be opened under a maximum pressure of 15 lb.

Quality Standards:

Butts and Hinges: ANSI A156.1
Locks and Lock Trim: ANSI A156.2
Door Controls--Closer: ANSI A156.4
Architectural Door Trim: ANSI A156.6
Template Hinge Dimensions: ANSI A156.7
Door Controls - Overhead Holders: ANSI A156.8
Thresholds, Kick Plates: ANSI A156.6
Material and Finishes: BHMA 1301.

MATERIALS AND FABRICATION:

Hand of Door: The drawings show the direction of swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.

Base Metals: Produce hardware units of the basic metal and forming method indicated using the manufacturer's standard metal alloy, composition, temper, and hardness. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified. Comply with basic metal and forming method requirements of NFPA 80 and UL or Warnock Hersey or FM for hardware units on fire-rated door assemblies.

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Section Title: **Door Hardware**
Revision Number: 0

Project Number: N/A
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1 Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for
2 machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal
3 screws, except as specifically indicated.
4

5 Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as
6 otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if
7 exposed in surfaces of other work, to match finish of this other work as closely as possible including
8 "prepared for paint" surfaces to receive painted finish.

9 Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent
10 no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for
11 installation where bolt head or nut on opposite face is exposed in other work unless their use is the only
12 means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a
13 means of reinforcing the work, provide sleeves for each thru-bolt.
14

15 HINGES, BUTTS, AND PIVOTS:

16
17 Number of Hinges: Provide number of hinges indicated but not less than three hinges per door leaf for
18 doors 90 in. or less in height and one additional hinge for each 30 in. of additional height.
19

20 LOCKS, LATCHES, AND BOLTS:

21
22 Lock Throw: Provide 5/8-in. minimum throw of latch on pairs of doors. Comply with UL requirements
23 for throw of bolts and latch bolts on rated fire openings. Provide 3/4-in. minimum throw of latch for
24 mortise locks. Provide 1-in. minimum throw for all dead bolts.
25

26 Interchangeable Core: Provide lock sets and cylinders compatible with government-furnished and
27 installed Best Universal Lock Co. Inc. 7-pin interchangeable cores and No. 1EC4 cams.
28

29 CLOSER AND DOOR CONTROL DEVICES:

30
31 Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's
32 recommendations for size of door control unit depending on size of door, exposure to weather, and
33 anticipated frequency of use. Where parallel arms are indicated for closer, provide closer unit one size
34 larger than recommended for use with standard arms. Provide parallel arms for all exterior overhead
35 closers and track arms for all interior overhead closers, except as otherwise indicated. Provide extended
36 spindle on closer as may be necessary to accommodate thickness of frame-mounted hardware.
37

38 Access-Free Manual Closer: Provide adjustable units complying with ANSI A117.1 provisions for door
39 opening force and delayed action closing.
40

41 WEATHER STRIPPING AND SEALS:

42
43 General: Provide continuous weather stripping on exterior doors and smoke, light, or sound seals on
44 interior doors where indicated or scheduled. Provide only those units where resilient or flexible seal strip
45 is easily replaceable and readily available from stocks maintained by manufacturer.
46

Project Title: **ISB Injection System**
Section Title: **Door Hardware**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 HARDWARE FINISHES:

2
3 Provide matching finish for hardware units at each door or opening. Reduce differences in color and
4 textures as much as commercially possible where the base metal or metal forming process is different for
5 individual units of hardware exposed at the same door or opening. In general, match items to the
6 manufacturer's standard finish for the latch and lock set (or push-pull units if no latch or lock sets) for
7 color and texture.

8
9 Provide quality of finish including thickness of plating or coating (if any), composition, hardness and
10 other qualities complying with manufacturer's standards, but in no case less than specified for the
11 applicable units of hardware by referenced standards.

12
13 The designations used in schedules and elsewhere to indicate hardware finishes are the industry-
14 recognized standard commercial finishes, except as otherwise noted.

15
16 The designations used in schedules and elsewhere to indicate hardware finishes are those listed in
17 ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S.
18 finishes shown by certain manufacturers for their products.

19
20 PART 3--EXECUTION

21
22 INSTALLATION:

23
24 Mount hardware units at heights indicated in the following applicable publication, except as specifically
25 indicated or required to comply with governing regulations and except as otherwise directed by the
26 Contractor.

27
28 Steel Doors and Frames: "Recommended Locations for Builders Hardware for Standard Steel
29 Doors and Frames" by the Door and Hardware Institute.

30
31 Install each hardware item in compliance with the manufacturer's instructions and recommendations.
32 Wherever cutting and fitting are required to install hardware onto or into surfaces that are later to be
33 painted or finished in another way, care shall be taken to prevent scuffing. Coordinate removal, storage,
34 and reinstallation or application of surface protections with finishing work specified in the Division 9
35 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

36
37 Set until level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as
38 necessary for proper installation and operation.

39
40 Drill and counter sink units that are not factory-prepared for anchorage fasteners. Space fasteners and
41 anchors in accordance with industry standards. Do not use thru bolting for installing surface-mounted
42 hardware units, except as otherwise scheduled or specified elsewhere in this section.

43
44 Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

45
46 Install electromagnetic holders according to manufacturer's written instructions and in coordination with
47 Division 16 sections for electrical requirements.

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Section Title: **Door Hardware**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 ADJUST AND CLEAN:
2

3 Adjust and check each operating item of hardware and each door to ensure proper operation or function of
4 every unit. Replace those that cannot be adjusted to operate freely and smoothly as intended for the
5 application made. Clean adjacent surfaces soiled by hardware installation.
6

7 Final Adjustment: Wherever hardware installation is made more than 1 month prior to acceptance or
8 occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and
9 make final check and adjustment of all hardware items in such space or area. Clean operating items as
10 necessary to restore proper function and finish of hardware and doors. Adjust door control devices to
11 compensate for final operation of heating and ventilating equipment.
12

13 FIELD QUALITY CONTROL:
14

15 The Contractor's Representative will perform surveillance to verify compliance of the work to the
16 drawings and specifications.
17

18 HARDWARE SCHEDULE:
19

20 Group No. 1: Exterior Flush Single Door
21

22 Butts:	1 1/2 pair McKinney T4A3386 4.5 x 4.5 x BHMA 630.
23 Lockset:	1 Best 84K-7-C-15D-S3 x BHMA 626.
24 Closer:	1 LCN P4041 x BHMA 673.
25 Weather Stripping:	1 set Pemko 319CN x S88 x BHMA 628.
26 Kickplate:	1 12 x 34 x 1/16 in. x beveled edge x BHMA 630.
27 Door Bottom:	1 Pemko 430CRL x BHMA 628.
28 Threshold:	1 Pemko 254X4AFG x BHMA 628.

29

30 Group No. 2: Interior Non-Rated Single Door
31

32 Butts:	1 1/2 pair McKinney T4A3386 4.5 x 4.5 x BHMA 626.
33 Lockset:	1 Best 84K-0-N-15D-S3 x BHMA 626.
34 Silencers:	5 Glynn-Johnson 64.
35 Kickplate:	2 12 x 34 x 1/16 in. x beveled edge x BHMA 630.
36 Wall Stop:	1 Glynn-Johnson 50C x BHMA 628.

37

38 END OF SECTION 08700

Project Title: **ISB Injection System**
Section Title: **Gypsum Drywall**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 09250--GYPSUM DRYWALL

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Subcontractor shall provide all material, labor, and equipment to install gypsum wallboard—including all
8 trim, accessories, and taping—complete and ready for painting.

9
10 Section Includes: Work includes, but is not limited to:

11
12 Gypsum wallboard on interior partitions
13 Interior insulation/finish board on walls and ceilings
14 Resilient wall base.

15
16 Related Sections: The following sections contain requirements that relate to the work of this section:

17
18 Section 13120, "Metal Building Systems"
19 Section 13121, "Mezzanine"

20
21 REFERENCES:

22
23 The following documents, including others referenced therein, form part of this section to the extent
24 designated herein:

25
26 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

27
28 ASTM C36 "Standard Specification for Gypsum Wallboard"
29 ASTM C475 "Standard Specification for Joint Compound and Joint Tape for Finishing
30 Gypsum Board"
31 ASTM C630 "Standard Specification for Water-Resistant Gypsum Backing Board"
32 ASTM C840 "Standard Specification for Application and Finishing of Gypsum Board"
33 ASTM C1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the
34 Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or
35 Steel Studs"

36
37 SUBMITTALS:

38
39 Submittals for Review: No vendor data are required for this section unless an "or-equal" item is proposed.
40 "Or-equal" items require contractor approval prior to purchase.

41
42 Submittals for Information: None.

43
44 Submittals for Project Closeout: None.

45
46 QUALITY CONTROL:

47
48 Single-Source Responsibility: Obtain gypsum board products from a single manufacturer or from
49 manufacturers recommended by the primary manufacturer of gypsum boards.

Project Title: **ISB Injection System**
Section Title: **Gypsum Drywall**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 DELIVERY, STORAGE, AND HANDLING:

2
3 Deliver gypsum drywall materials in sealed containers or bundles identified with manufacturer, name,
4 brand, type, and grade. Store in a dry, well-ventilated space that is protected from weather, undercover,
5 and off the ground or floor.

6
7 Environmental Conditions:

8
9 Temperature shall be 55°F minimum day and night during entire joint operation and until building
10 is occupied

11
12 Provide ventilation to eliminate excessive moisture

13
14 Avoid hot air drafts, which will cause too rapid drying.

15
16 PART 2--PRODUCTS

17
18 GYPSUM WALLBOARD MATERIALS:

19
20 Gypsum Wallboard: ASTM C36, 5/8-in.-thick gypsum wallboard with tapered edges.

21
22 Screws: Screws for attachment of gypsum board shall be Type S for light-gauge steel framing (22 gauge
23 or lighter), Type S-12 for heavy-gauge steel framing (20 to 12 gauge).

24
25 Structural Accessories: Galvanized steel, 25-gauge minimum, 2.5-in. by 2.5-in. furring angles and
26 Z-furring channels, and roll-formed, hat-shaped channels, as required and shown for complete system
27 installation; United States Gypsum Co., or approved equals.

28
29 Tape and Cement: Tape and cement for finishing the joints shall be of material specifically manufactured
30 for that purpose and shall be United States Gypsum Co. "Perf-A-Tape" or approved equal.

31
32 Metal Trim: Steel-edge trim and corner reinforcement shall be United States Gypsum Co. "200-B" and
33 "Dur-A-Bead," respectively, or approved equals.

34
35 INSULATION/ FINISH BOARD:

36
37 General: Composite finish board system, composed of glass-fiber reinforced polyisocyanurate rigid
38 insulation board core with laminated aluminum sheet face and back surfaces. Face sheets shall be finished
39 with manufacturer's standard baked-on enamel coating system.

40
41 Finish Wallboards: 1/2-in. nominal thickness; 16.5 mil white embossed, acrylic-coated aluminum sheet
42 laminated to 1.0 mil plain aluminum sheet on exposed side and 1.0 mil plain aluminum sheet on back
43 side. Celotex Corp. "Thermax Heavy Duty Plus" or approved equal.

44 Finish Ceiling Boards: 1/2 nominal thickness; 1.25-mil white embossed acrylic-coated aluminum sheet on
45 exposed side and 1.25-mil plain aluminum sheet on backside. Celotex Corp. "Thermax Light Duty" or
46 approved equal.

47
48 Accessories: Manufacturer's standard components for shiplap joint application.

Project Title: **ISB Injection System**
Section Title: **Gypsum Drywall**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 RESILIENT WALL BASE:

2
3 Base: 4-in.-wide straight rubber base work molded corners and accessories; Roppe Corp., Color No. 99,
4 "Bone," or approved equal.

5
6 Adhesive: In accordance with base manufacturer's recommendation for application intended.

7
8 PART 3--EXECUTION

9
10 GYPSUM WALL BOARD INSTALLATION:

11
12 Framing: The Subcontractor shall check the alignment of framing members and make necessary
13 adjustments before proceeding with installation of the wallboard. Wall and ceiling framing shall be
14 spaced 16 in. on center, unless shown otherwise. Framing members shall be straight and in alignment, and
15 headers shall be installed for solid support of fixture attachments, wherever necessary. Blocking shall be
16 installed behind all wallboard edges and joints.

17
18 Wallboard: Cut and fit gypsum accurately, in the longest lengths possible, with long edges parallel or
19 perpendicular to main framing. Joints on opposite sides of partitions shall not fall on the same stud. All
20 field cut and rough edges shall be sanded smooth and straight. All joints shall be firmly butted together
21 without damaging the edges of the wallboard. Screw wallboard securely to supports, spacing the fasteners
22 not less than 3/8 in. or not more than 5/8 in. from edges and ends of the boards, 10 to 12 in. o.c. Adjust
23 power screwdriver to set heads in 1/32-in. dimple. Do not break face paper. If face is accidentally broken,
24 apply second screw 2 in. away. Screws on adjacent ends or edges should be opposite each other. The
25 boards shall be fastened at all intermediate studs, joists, and blocking using the same spacing as that
26 around edges. Steel corner-reinforcement shall be installed on all outside corners.

27
28 Texturing: All gypsum board walls shall be provided with a light-textured surface using commercially
29 available, ready-to-use texturing products or by mixing joint compound with water to a thick paint
30 consistency. Texture shall be applied with a roller or other approved method.

31
32 INSULATION/FINISH BOARD INSTALLATION:

33
34 General: Comply with manufacturer's written instructions and recommendations for application and
35 location, as shown.

36
37 WALL BASE INSTALLATION:

38
39 General: Comply with manufacturer's written instructions and recommendations for application and
40 location, as shown.

41
42 PROTECTION OF WORK:

43
44 Subcontractor shall protect gypsum drywall work from damage and deterioration during the entire
45 construction period.

46
47 No taping or texturing shall be done when temperature is below the manufacturer's recommended
48 application temperature, and in no case shall the temperature be below 40°F for 24 hours following
49 application.

Project Title: **ISB Injection System**
Section Title: **Gypsum Drywall**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 FIELD QUALITY CONTROL:

2

3 Surveillance will be performed by the Contractor's Representative to verify compliance of the work to the
4 drawings and specifications.

5

6 END OF SECTION 09250

Project Title: **ISB Injection System**
Section Title: **Painting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 09900--PAINTING

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Section Includes: Work includes, but is not limited to, surface preparation and field or shop painting of
8 the following:

- 9
10 Exposed exterior items and surfaces
11 Exposed interior items and surfaces
12 Surface preparation, priming, and finish coats specified in this section in addition to shop priming
13 and surface treatment specified in other sections.
14

15 Related Sections: The following sections contain requirements that relate to the work of this section:

- 16
17 Section 05100, "Structural Steel and Miscellaneous Metals"
18 Section 13120, "Metal Building Systems"
19 Section 13121, "Mezzanine."
20

21 Prefinished Items: Unless otherwise indicated, do not include field painting when factory-finishing is
22 specified for such items as (but not limited to) prefinished partition systems; acoustic materials and
23 casework; finished mechanical and electrical equipment including light fixtures, switchgear, and
24 distribution cabinets; equipment; and cast iron gratings.
25

26 Metal surfaces of anodized aluminum, chromium plate, copper, bronze, stainless steel, and similar
27 finished materials will not require finish painting, unless otherwise indicated.
28

29 Metal Fire Rating Labels: Do not paint over any code-required labels, such as Underwriters' Laboratories
30 and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
31

32 SUBMITTALS:

33
34 Submittals for review:

35 Product Data: Submit copies of manufacturer's technical information, including paint label analysis and
36 application instructions, for each material section for approval by the Contractor's Representative prior to
37 purchase.
38

39 MSDSs: Submit copies of MSDSs on all products used for approval by the Contractor's Representative
40 prior to construction start.
41

42 Samples: Submit copies of manufacturer's full range of color chips for selection by the Contractor's
43 Representative. If a nonstandard color is required to match an existing color, submit three paint samples
44 on 12-in. square hardboard for approval by the Contractor's Representative prior to purchase.
45

46 Submittals for information: None.
47

48 Submittals for project closeout: None.
49

Project Title: **ISB Injection System**
Section Title: **Painting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 QUALITY CONTROL:

2
3 Applicator Qualifications: Engage an experienced applicator who is regularly engaged in the application
4 and installation of, and has successfully completed, coating system applications similar in material and
5 extent to those in this project.

6
7 Single-Source Responsibility: Provide primers and undercoat material produced by the same
8 manufacturer as the finish coats and as recommended for the particular substrate and finish coat.

9
10 DELIVERY, STORAGE, AND HANDLING:

11
12 General: Deliver materials to the job site in the manufacturer's original, new, and unopened packages and
13 containers bearing the manufacturer's name and label and the following information:

- 14
15 Name or title of material
16 Product description (generic classification or binder type)
17 Manufacturer's name, stock number, and date of manufacture
18 Contents by volume, for major pigment and vehicle constituents
19 Thinning instructions
20 Application instructions
21 Color name and number
22 Handling instructions and precautions.

23
24 Storage: Store materials not used in tightly covered containers in a well-ventilated area at a minimum
25 ambient temperature of 45°F. Maintain containers used in storage in a clean condition, free of foreign
26 materials and residue. Volatile liquids and used wiping and cleaning rags shall be kept in tightly closed
27 metal containers. After each day's work, empty paint cans and other waste shall be removed from the
28 premises and disposed of as directed by the Contractor. Only 1 day's supply of paint may be brought into
29 the work area. Any extra paint must be removed from the work area at the end of each day, unless
30 otherwise approved by the Contractor. The Subcontractor shall store and handle all paint in a well-
31 ventilated area or room.

32
33 PART 2--PRODUCTS

34
35 MANUFACTURERS:

36
37 Subject to compliance with requirements, provide products of one of the following:

- 38
39 Benjamin-Moore
40 Columbia Paint Company
41 Devoe and Reynolds Company (ICI)
42 Fuller-O'Brien (ICI)
43 The Glidden Company (ICI)
44 ICI Dulux (ICI)
45 Ponderosa Paint Company
46 Pratt and Lambert
47 Sherwin-Williams Company.
48

Project Title: **ISB Injection System**
Section Title: **Painting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 MATERIALS:

2
3 Paint shall be well ground; shall not settle excessively, cake, or thicken in the container; shall be readily
4 broken up with paddle to a smooth consistency; and shall show easy brushing properties. Products
5 containing lead or known carcinogens shall not be used. All products used shall comply with volatile
6 organic compound (VOC) requirements.

7
8 Solids by volume for latex-based coatings shall be not less than 30%. Solids by volume for alkyd-based
9 coatings shall not be less than 40%. Solids by volume for wood stains and transparent finishes shall be not
10 less than 20%.

11
12 PAINT SCHEDULE (EXTERIOR):

13
14 Ferrous Metal:

15
16 Deep-Color, Full-Gloss, Alkyd-Enamel Finish:

17 Primer: Rust-inhibitive metal primer

18 First and Second Coats: Full-gloss, exterior, alkyd enamel

19 Finish Color: As shown

20
21 Galvanized Metal:

22
23 Full-Gloss, Silicone-Modified Alkyd-Enamel Finish:

24 Primer: Galvanized metal primer

25 First and Second Coats: Full-gloss, exterior, silicone-modified alkyd-enamel

26 Finish Color: As shown

27
28 PAINT SCHEDULE (INTERIOR):

29
30 Plywood:

31
32 Semi-Gloss Acrylic Finish:

33 Primer: Exterior, acrylic-latex primer

34 First and Second Coats: Semigloss, exterior, acrylic-latex paint

35 Finish Color: No. SW1683

36
37 Ferrous Metal:

38
39 Full-Gloss, Acrylic-Enamel Finish:

40 Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer

41 First and Second Coats: Full-gloss, interior, acrylic-latex enamel

42 Finish Color: No. SW1811

43
44 Galvanized Metal:

45
46 Full-Gloss, Acrylic-Enamel Finish:

47 Primer: Galvanized metal primer

48 First and Second Coats: Full-gloss, acrylic-latex interior enamel

49 Finish Color: No. SW1811

Project Title: **ISB Injection System**
Section Title: **Painting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Gypsum Board:
2

3 Semi-Gloss, Acrylic-Enamel Finish:

4 Primer: Latex-based interior primer

5 First and Second Coats: Semigloss, acrylic-latex, interior enamel

6 Finish Color: No. SW1683
7

8 Colors: Colors, except as specified hereinafter, shall be approved by the Contractor's Architect/Engineer
9 from full range of current color charts or chips submitted by the Subcontractor and shall match color chart
10 names/numbers from Sherwin-Williams Co., as indicated. Color charts or chips shall be made by the
11 manufacturer of the paint or labels to be used on the work covered herein. If the same colors required are
12 not available in ready-mixed paint, the Subcontractor shall prepare special mixes and submit samples of
13 such mixes to the Contractor for approval.
14

15 PART 3--EXECUTION

16 APPLICATION AND WORKMANSHIP:
17

18
19 General: No paint shall be thinned or otherwise altered in any manner other than recommended by the
20 paint manufacturer. All paint shall be applied in strict accordance with the manufacturer's instructions,
21 unless specified otherwise herein.
22

23 Number of Coats:
24

25 New Work: One coat of primer and two coats of finish paint, except as noted otherwise on the
26 drawings or in these specifications
27

28 Existing Work: Two coats of finish paint
29

30 Paint Film Thickness: Dry film thickness of paint films above substrate or existing paint surface shall be
31 as recommended by the paint manufacturer for each coat. However, the accumulated dry film thickness
32 above substrate or existing paint surface shall not be less than 2.5 mil. A wet film gauge shall be used to
33 determine dry film thickness on nonmagnetic surfaces. Dry film thickness is the wet film thickness
34 multiplied by the percent of solids by volume of the paint.
35

36 Surface Preparation: All surfaces to be painted shall be clean, smooth, dry, and free of corrosion. The
37 Subcontractor shall follow the paint manufacturer's recommendations for surface preparation strictly for
38 the particular substrate being painted and shall submit copies of the surface preparation instructions as
39 called for on the Vendor Data Schedule. All hardware, fixtures, fixture plate, and similar factory-finished
40 items shall be removed or covered in an approved manner before painting commences. All items shall be
41 replaced and/or uncovered when the painting work is complete. Masonry and concrete surfaces shall be
42 free of mortar splatters, caulking, or other foreign matter. Welds that are not prime coated shall be cleaned
43 by wire brushing.
44

45 Damaged Prime Coat or Factory Finish: The Subcontractor shall repair damaged shop prime or factory
46 finish coats of paint of any material, fabricated steel, or equipment to be installed. Chipped or scratched
47 areas shall be sanded or wire brushed to bare metal, feathered, and spot primed before finish paint is
48 applied. All prime coats on structural steel and miscellaneous metals that have been damaged, or affected
49 by welding during erection, shall be brushed, cleaned, and painted with a prime coat after erection;

Project Title: **ISB Injection System**
Section Title: **Painting**
Revision Number: 0

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1 however, painted concealed surfaces shall be painted before erection. The paint for repair of finish
2 painting shall be the same color as the factory finish coat.

3
4 Protection: All equipment and materials, flange faces, and other machined or finished surfaces, floors,
5 furniture, plumbing and electrical fixtures, and construction work—including window and door glass—
6 that is not to be painted or is factory finished shall be protected from paint splatter during painting
7 operations with drop cloths, paper, masking tape, or other approved means. Painted surfaces on existing
8 work, not to be painted under this Subcontract, that are damaged as a result of the Subcontractor's
9 operations shall be repaired by the Subcontractor by priming the touch-up as required to match the
10 undamaged surfaces. Remove all oily rags and waste from the building each night. Take every precaution
11 to avoid danger of fire.

12
13 Application: Paint shall be applied in such manner as to preclude runs, sagging, brush marks, holidays, or
14 other defects in the finished surface. (No spray painting will be allowed within buildings.) Each coat of
15 paint shall have a slightly different shade of color so that each coat will be distinguishable from the
16 preceding coat. No painting shall be done when the ambient temperature is less than 50°F or when the
17 temperature during the drying period is apt to drop below 50°F. In areas of fresh-painted surfaces where
18 the temperature has dropped below 45°F during the drying period, the area shall be brought back to or
19 above 45°F and the drying period extended to 48 hours. Otherwise, all paint shall be applied in strict
20 accordance with the paint manufacturer's directions, including use of respirators where required by the
21 manufacturer's instructions.

22
23 Cleanup: Upon completion of the work, the Subcontractor shall remove all surplus materials and rubbish
24 and remove all paint spots from hardware, equipment, floors, glass and walls, etc. The Subcontractor shall
25 remove all excess materials and equipment from the premises and leave the area in a clean and orderly
26 condition.

27
28 COLOR SCHEDULE:

29
30 General: Colors and gloss, as scheduled, are standard model numbers and colors from Sherwin-Williams
31 Co. full range of colors, except as otherwise indicated. Provide colors and gloss from manufacturer's full
32 range of colors approved by the Contractor's Architect/Engineer as matching scheduled colors.

33
34 Color Schedule:

35
36 Exposed Structural Steel and Miscellaneous Metals Full Gloss No. SW1811
37 Exposed Building System Frames Full Gloss No. SW1811
38 Exposed Building System Personnel Doors and Frames Full gloss, match wall panels
39 Exposed Building System Service Door Frames Full gloss, match wall panels
40 Interior Steel Doors and Frames Full Gloss No. SW1811
41 Gypsum Wallboard Semigloss No. SW1683
42 Pipe Bollards Full Gloss "Safety Yellow"
43 Electrical Backboard Semigloss No. SW1683
44

Project Title: **ISB Injection System**
Section Title: **Painting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 FIELD QUALITY CONTROL:

2

3 The Contractor's Representative will perform surveillance to verify compliance of the work to the
4 drawings and specifications.

5

6 END OF SECTION 09900

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 13120--METAL BUILDING SYSTEMS

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall furnish and install metal building systems, complete, as shown on the subcontract
8 drawings and as specified herein.

9
10 Section Includes: Work includes, but is not limited to:

11
12 Primary and secondary structural framing
13 Roof panels
14 Wall panels
15 Exterior doorframes
16 Exterior personnel doors
17 Accessories and trim
18 Interim office and lab Mezzanine System.

19
20 Related Sections:

21
22 Section 05100, "Structural Steel and Miscellaneous Metals"
23 Section 07190, "Vapor Barriers"
24 Section 07200, "Thermal Insulation"
25 Section 07901, "Joint Sealants"
26 Section 08110, "Steel Doors and Frames"
27 Section 08362, "Overhead Sectional Doors"
28 Section 08521, "Aluminum Hung Windows"
29 Section 13121, "Mezzanine"
30 Section 15025, "Welding."

31
32 REFERENCES:

33
34 The following codes and standards, including others referenced therein, form a part of this section to the
35 extent specified herein:

36
37 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

38
39 AISC (ASD) "Specification for Structural Steel for Buildings – Allowable Stress Design
40 (ASD)"

41
42 AMERICAN IRON AND STEEL INSTITUTE (AISI)

43
44 AISI "Specification for the Design of Cold-Formed Steel Structural Members"

45
46 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

47
48 ASTM A36 "Standard Specification for Carbon Structural Steel"

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

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- 1 ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated,
2 Welded and Seamless”
- 3 ASTM A325 “Standard Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi
4 Minimum Tensile Strength”
- 5 ASTM A500 “Standard Specification for Cold-Formed Welded and Seamless Carbon Steel
6 Structural Tubing in Rounds and Shapes”
- 7 ASTM A501 “Standard Specification for Hot-Formed Welded and Seamless Carbon Steel
8 Structural Tubing”
- 9 ASTM A529 “Standard Specification for High-Strength Carbon-Manganese Steel of Structural
10 Quality”
- 11 ASTM A572 “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium
12 Structural Steel”
- 13 ASTM A607 Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy,
14 Columbium or Vanadium, or Both, Hot-Rolled, and Cold-Rolled
- 15 ASTM A755 “Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process
16 and Prepainted by the Coil-Coating Process for Exterior Exposed Building
17 Products”
- 18 ASTM A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-
19 Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
- 20 ASTM A1011 “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
21 Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with
22 Improved Formability”

23
24 METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

- 25
- 26 MBMA *Recommended Design Practices Manual*, for applicable loads and load
27 combinations
- 28 MBMA *Metal Building Systems Manual*, for collateral loads
- 29

30 INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

- 31
- 32 UBC *Uniform Building Code*
- 33 IBC *International Building Code*
- 34

35 SUBMITTALS:

36

37

38 Shop Drawings: Submit shop drawings prior to construction start that completely detail all major trusses
39 (if any), rigid frames, purlin/girt locations, columns, wall panels, roof panels, ceiling panels, windows,
40 doors, base plates, anchor bolts, anchor bolt locations, portal frame locations, rain gutters, downspouts,
41 flashings and wall base conditions, and any other graphic information required to evaluate the complete
42 structure, including all dimensions. Shop drawings shall conform to the results of the design calculations.

43

44 Design calculations: Submit design calculations prior to construction start showing all loads specified. A
45 Registered Professional Structural Engineer shall stamp all design calculations.

46

47 Warranties: Submit sample warranties for approval prior to procurement. Submit three copies of executed
48 warranties for information to Contractor’s Representative before final acceptance of the project.

49

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Certification: Before final acceptance, submit certification that panels and accessories have been installed
2 in accordance with the manufacturer's specifications.

3
4 Interior Building Volume: The HVAC system is designed around the volume of the specified building.
5 Submit HVAC calculations prior to construction start if an "or equal" metal building is proposed and the
6 internal volume of the proposed building is 5% greater or smaller than the specified building. Calculations
7 shall include the size of fans, filters, and ductwork.

8
9 QUALITY CONTROL:

10
11 Regulatory Requirements (Codes and Standards): Comply with provisions of the following codes and
12 standards, unless otherwise specified:

13
14 Structural Steel:

15
16 AISC (ASD) or AISC (LRFD)

17
18 Primary and Secondary Members:

19
20 MBMA *Recommended Design Practices Manual*, for applicable loads and load
21 combinations

22 MBMA *Metal Building Systems Manual*, for collateral loads

23 IBC "Wind and Seismic Loads"

24
25 Qualifications: Provide prefabricated metal buildings as produced by a manufacturer who is regularly
26 engaged in fabrication of pre-engineered metal structures of type and quality indicated. All components
27 shall be provided from one manufacturer.

28
29 WARRANTIES:

30
31 The roofing and siding shall be warranted for a minimum of 20 years against wind damage, leakage, paint
32 fade, chipping, peeling, attachment, and rusting. Warranty shall include labor and materials for
33 replacement of defective panels. Warranty shall not be pro-rated over 20-year period.

34
35 PART 2--PRODUCTS

36
37 MANUFACTURER:

38
39 Building shall be as manufactured by Butler Building Systems or approved equal. Design details,
40 dimensions, and sizes are based on a Butler building. If an "or equal" is submitted, all Butler dimensions
41 and clearances shall be taken as minimums for evaluation of submittal. Subcontractor shall be responsible
42 for all adjustments required to plans as a consequence of changing building manufacturer. Subcontractor
43 shall provide calculations on sizes and number of anchor bolts required to develop building reactions. All
44 calculations, shop drawings, and special process procedures—such as welding, painting, and structural
45 bolting—shall be submitted for approval and shall be stamped by a Registered Professional Engineer
46 licensed to practice Structural Engineering in the State of Idaho.

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
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1 Type: The metal building shall be a prefabricated, weather-tight, and freestanding building having a
2 structural steel frame. The building shall be a rigid frame. The roof slope shall be 3 in. per ft. Clear height
3 shall be 20 ft minimum.

4
5 DESIGN LOADS:

6
7 The building shall be designed for the following applied loads in addition to dead load:

8
9 Vertical Live Loads: Roof covering shall be designed for either 50 psf uniformly distributed or a 200-lb
10 concentrated load (over a 1 × 1-ft area) located at center of maximum roofing span.

11
12 All other building components shall be designed for a 30-psf snow load, with an allowance for ice
13 buildup at the eaves.

14
15 Wind Loads: The wind load on the structure shall be designed for an 80-mph wind speed, calculated
16 according to the Uniform Building Code (UBC) exposure Class "C."

17
18 Seismic Loads: Seismic loads shall be determined and applied in accordance with the UBC Zone 2b.

19
20 Auxiliary Loads: All dynamic live loads required by the contract document, such as material handling
21 systems and vibrating equipment.

22
23 Collateral Loads: All additional dead loads, other than the weight of the metal building system, such as
24 mechanical HVAC systems, electrical systems, and ceilings. Collateral loads shall be a minimum of
25 10 pounds per square foot, as defined in the *Metal Building Systems Manual* published by the MBMA.

26
27 Maximum Deflection: Deflection shall be limited to L/240 for all building components.

28
29 Combination of Loads: The combining of normal loads, auxiliary loads, and collateral loads for design
30 purposes shall be as prescribed and recommended by the MBMA *Recommended Design Practices*
31 *Manual*.

32
33 Mezzanine System: The effects of the Mezzanine System on the structural components shall be
34 considered in the design. The Mezzanine System shall be constructed of light-gauge cold-rolled-steel
35 studwalls on 24-in. minimum centers.

36
37 Anchorage Points: Rated for 5,000-lb static load.

38
39 MATERIALS:

40
41 Hot-Rolled Structural Shapes: Conform to ASTM A36 or A529, Grade 50.

42
43 Tubing or Pipe: Conform to ASTM A500, Grade B; ASTM A501; or ASTM A53.

44
45 Members Fabricated from Plate or Bar Stock: 42,000-psi minimum yield strength; Conform to
46 ASTM A529, A1011, or A572.

47
48 Members Fabricated by Cold Forming: Conform to ASTM A1008, Grade 50.

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Galvanized Steel Sheet: Conform to ASTM A653 with G90 coating. "Class" to suit building
2 manufacturer's standards.

3
4 **STRUCTURAL FRAMING COMPONENTS:**

5
6 Rigid Frames: Rigid frames shall be hot-rolled structural steel, factory welded, and shop painted. Furnish
7 complete with attachment plates, bearing plates, and splice members. Factory drilled for bolted field
8 assembly.

9
10 Length of span and spacing of frames shall be as shown on drawings, except slight roof slope variations
11 are acceptable to meet manufacturer's standard.

12
13 Wind Bracing: No "x" type rod bracing shall be used in bays where bracing would cross the window or
14 door openings or interfere with process systems or piping. If "x" type bracing cannot be used, knee
15 bracing (as shown in the drawings) or portal frame bracing may be used.

16
17 Secondary Framing: Purlins, eave girts, girts, flange and sag bracings shall be "Z" or "C" roll formed
18 sections prepunched for fasteners and shall be shop painted. Roof purlins shall be spaced a maximum of
19 5 ft o.c. Base channel, sill angle, purlin spacers shall be minimum of 14-gauge cold-formed steel.

20
21 Anchor Bolts: The building system's manufacturer shall design the anchor bolts for the rigid frames.
22 Location and placement shall be coordinated with the foundation rebar shown on the drawings. Any
23 changes in rebar placement shall be brought to the attention of the Contractor and engineering
24 calculations shall be provided taking into account the changed rebar location.

25
26 Bolts: Bolts shall conform to ASTM A325 in quantities necessary for design loads and connection details.
27 Provide zinc- or cadmium-plated units when in direct contact with panels. Direct tension indicators shall
28 be provided, as specified in Section 05100, "Structural Steel and Miscellaneous Metals," of these
29 specifications.

30
31 Fabrication: Shop fabricate to the indicated size and section, complete with base plates, bearing plates,
32 and other plates as required for erection, welded in place, and with all required holes for anchoring or
33 connections shop drilled or punched to template dimensions.

34
35 Shop connections shall be power riveted, bolted, or welded.

36
37 Field connections shall be bolted.

38
39 Anchorage Points: Supply two anchor points located on ridgeline 10 ft from each side of roof.

40
41 Shop Painting: Surfaces to be primed shall be cleaned of loose mill scale, rust, dirt, oil, grease, and other
42 matter precluding paint bond. Follow the SSPC-SP3 procedure for power tool cleaning, SSPC-SP2
43 procedure for hand tool cleaning, and SSPC-SP1 procedure for solvent cleaning.

44
45 Prime structural steel primary and secondary framing members with manufacturer's standard rust-
46 inhibitive primer having over 50% rust-inhibitive pigment, such as organic zinc. No lead or chromate will
47 be allowed.

48
49 Prime galvanized members, after phosphoric acid pretreatment, with zinc dust-zinc oxide primer.

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 ROOFING AND SIDING:
2

3 General: Provide roofing and siding sheets formed to general profile or configuration, as specified.
4 Provide flashings, closers, fillers, metal expansion joints, ridge covers, and other sheet metal accessories,
5 factory formed of same material and finish as roofing and siding.
6

7 Roof Panels: The Interlocking-Standing Seam Roof Covering shall carry an Underwriters' Laboratories,
8 Inc., Uplift Classification of not less than Class 90 and shall consist of material not less than 24-gauge
9 aluminized coated steel. The panels shall be installed with the ribs upstanding and parallel to the roof
10 slope.
11

12 All longitudinal interlocking ribs as well as any transverse end laps shall be properly sealed, according to
13 the manufacturer's instructions, with nondrying sealant.
14

15 The roof panels shall be secured to each structural support by a steel clip concealed between the adjacent
16 male and female ribs and fastened under that panel's weather surface. Clip shall be long enough to allow
17 Styrofoam thermal spacer on top of purlin.
18

19 Penetrations through the roof panel by fasteners shall be limited to only those required at the rake eaves,
20 at end laps and at the ridge. All exposed fasteners shall be fitted with weather-seal washers of
21 hydrocarbon-based elastomer (synthetic rubber) with a compatible metal backing.
22

23 Thermal (break) spacers shall be provided continuously at each structural support to minimize thermal
24 conductivity. The thermal spacer shall be a continuous extruded polystyrene insulation strip, 3 in.
25 wide × 1 in. thick.
26

27 Wall Panels Exterior: The Interlocking-Ribbed wall covering shall consist of 16-in.-wide embossed
28 panels, of not less than 24 U.S. gauge fluoropolymer enamel coated steel with approximately 3-in.-deep
29 male and female ribs. The panels shall be "ShadowRib," as manufactured by MBCI or approved equal.
30 The wall panels shall be applied to the structural framing with the interlocking ribs toward the interior of
31 the structure. The interlocking ribs shall be secured 16 in. o.c. at the base, at each intermediate girt, and
32 the support at which it terminates by means of an interior fastener, thus eliminating any thru-wall
33 fastening.
34

35 All interior fasteners (screws, bolts and nuts, etc.) shall be of carbon steel, having a protective coating of
36 either zinc or cadmium.
37

38 STEEL PERSONNEL DOORS:
39

40 Exterior Insulated Steel Doors: Manufacturer's standard thermally insulated doors with factory-finish and
41 glass lites as shown in compliance with requirements of Section 08110, "Steel Doors and Frames."
42

43 STEEL DOOR FRAMES:
44

45 Provide metal building systems manufacturer's standard factory-finished steel frames and components in
46 compliance with requirements of Section 08110, "Steel Doors and Frames," as shown and required for
47 erection and support of metal building system's wall framing. Extend jambs from floor to roof framing
48 for support of wall girt framing and door head frames.
49

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 ACCESSORIES:

2
3 Flexible Closure Strips: Closed-cell, expanded cellular rubber, self-extinguishing, cut or premolded to
4 match corrugation configuration of siding sheets. Provide to ensure weather-tight construction, at base
5 intermediate flashing and top of panels.

6
7 Sealing Tape: Sealing tape shall be 100% solids, pressure-sensitive grey polyisobutylene compound tape
8 with release paper backing. Not less than 1/2-in.-wide and 1/4-in.-thick, nonsag, nontoxic, nonstaining,
9 and permanently elastic.

10
11 Joint Sealant: Joint sealant shall be one-part elastomeric, polyurethane, polysulfide, or silicon rubber as
12 recommended by building manufacturer.

13
14 Mechanical Equipment Curbs and Flashing: Roof curbs for HVAC/mechanical equipment penetrations in
15 roof shall be as manufactured by Custom Curb Inc., for the specific application, or approved equal.

16
17 Ice Stops: Provide ice stops to prevent snow and ice damage to gutters. Ice stops shall be "ICEJAX" as
18 manufactured by Snowjax Inc., Mechanicsburg, Pennsylvania, or approved equal. "ICEJAX" shall be
19 adhered with Loctite "Depend," or approved equal, to metal roof panels.

20
21 FINISH:

22
23 Colors: Manufacturer's standard colors approved as matching colors from MBCI Co. as follows:

24
25 Wall Panels: "Almond"

26 Wall and Roof Edge Trim: "River Teal"

27 Roof Panels and Trim: "Natural Patina"

28 Exterior Door Frames: "River Teal"

29 Exterior Personnel Doors: "River Teal."

30
31 Fluoropolymer Finish: Provide factory-applied fluoropolymer finish to exterior galvanized steel siding,
32 interior liner wall, ceiling panels, and related trim and accessories.

33
34 PIPE PENETRATIONS:

35
36 For pipe penetrations through the roof and walls, use a "DEKTITE" pipe-flashing unit, as manufactured
37 by ITW Buildex or approved equal. Provide a stainless-steel hose clamp for positive sealing of flashing to
38 pipe.

39
40 PART 3--EXECUTION

41
42 CONSTRUCTION:

43
44 Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a
45 true, even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a
46 nonshrinking grout to obtain uniform bearing and to maintain a level baseline elevation. Moisten the cure
47 grout for not less than 7 days after placement.

48
49 Bracing: Install diagonal rod or angle bracing in roof, as required.

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Diagonal/rod bracing shall not interfere with ceiling purlins.

2
3 Install wind bracing in sidewalls, as specified.

4
5 Framed Openings: Provide shapes of proper design and size to reinforce opening and to carry loads and
6 vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach
7 structural frame to building. Comply with additional requirements of Section 08110, "Steel Doors and
8 Frames," for installation of steel personnel doors and frames. Reinforce doors and frames to receive
9 surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at the Project
10 site.

11
12 ROOFING AND SIDING:

13
14 General: Install panels and associated items for neat and weather-tight enclosure. Avoid "panel creep" or
15 application not true to line. Protect factory finish from damage.

16
17 Provide weather seal under ridge cap. Flash and seal roof panels at eave, swaged joints and rake with
18 manufacturer's standard rubber, neoprene, or other closures to exclude weather.

19
20 Roof Sheets: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof
21 sheeting and accessories.

22
23 Apply sealant tape continuous to clean, dry surface of weather side of fastenings on end laps and on side
24 laps of corrugated or nesting type, ribbed or fluted panels and elsewhere to make weatherproof to driving
25 rains.

26
27 Wall Sheets: Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete
28 foundation and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in
29 accordance with sealant manufacturer's recommendations.

30
31 Align bottoms of wall panels. Fasten flashings, trim around openings, etc. with self-tapping screws.

32
33 Sheet Metal Accessories: Install louvers and other sheet metal accessories in accordance with
34 manufacturer's recommendations for positive anchorage to building and weather-tight mounting.

35
36 Ceiling and Interior Wall Liner Panels: Install all ceiling and wall liner panels, as shown on the drawings.

37
38 Certification: The Subcontractor shall submit a certified statement that all standing seam metal roofing,
39 flashings, rain gutter and downspout, wall panels, fascia, structural framing, and anchor bolts have been
40 installed in strict accordance with the manufacturer's printed instructions and this specification.

41
42 FIELD QUALITY CONTROL:

43
44 Contractor-Supplied Testing:

45
46 General: Unless noted otherwise, the Contractor's Representative will inspect high-strength bolted
47 connections, perform tests and visual inspection, and prepare test reports.

48
49 Shop-Bolted Connections: Inspect in accordance with AISC specifications.

Project Title: **ISB Injection System**
Section Title: **Metal Building Systems**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

- 1 Shop Welding: Inspect during fabrication of structural steel, as required in Sections 05100 and 15025.
- 2
- 3 The Contractor's Representative will perform surveillance to verify compliance of the work to the
- 4 drawings and specifications.
- 5
- 6 END OF SECTION 13120

Project Title: **ISB Injection System**
Section Title: **Mezzanine**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 13121--MEZZANINE

2
3 PART 1---GENERAL

4
5 SUMMARY:

6
7 As required by this specification, the Subcontractor shall furnish and install one two-story mezzanine,
8 complete with frame, decking, walls, stairs, railing, laboratory counters, and cabinets.

9
10 Section Includes: Work includes, but is not limited to:

11
12 As required by this specification, furnish and install one mezzanine, complete with frame,
13 decking, stairs, restroom, railing, and laboratory counters and cabinets. Provide warranty and
14 submittals, as specified below.

15
16 Related Sections:

17
18 Section 08521, "Aluminum Hung Windows"
19 Section 13120, "Metal Building Systems"
20 Section 16000, "Electrical General Provisions"
21 Section 16120, "Cable, Wire, Connectors, and Miscellaneous Devices"
22

23 Performance Warranty:

24
25 Structural performance for the mezzanine shall be guaranteed based on the Vendor's calculations.
26 Provide modeling calculations to ensure acceptable load rates for office and laboratory space
27 areas.
28

29 REFERENCES: All equipment provided and the installation of the system shall comply with the
30 applicable sections of the following codes and standards:

31
32 ANSI C2 "National Electric Safety Code"
33 NFPA 70 "National Electric Code"
34 NEMA KS 1 "Enclosed Switches"
35 ASTM Structural steel standards
36 IBC, BOCA Builder's standard codes
37

38 SUBMITTALS:

39 Unless otherwise stated, submittals shall be made prior to construction start.

40
41 Submittals for review:

42 Vendor Approval: Subcontractor shall submit and obtain contractor approval of calculations, proposed
43 mezzanine, layout selected, equipment warranty, principal dimensions, and details of construction prior to
44 purchase and submittal of other required vendor data. The vendor's proposal package shall be approved
45 prior to mezzanine purchase.
46

47 A mezzanine design package shall be provided prior to delivery and will include:

48 Diagram of mezzanine
49 Vendor cut sheets for cabinets, counters, decking, and stairs

Project Title: **ISB Injection System**
Section Title: **Mezzanine**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Shop drawings, which are to include:
2 Principal dimensions and details of construction
3 Laboratory layout drawing
4 Electrical wiring diagrams
5 Plumbing layout.
6

7 Submittals for information:
8 Installation instructions (before final acceptance)
9 Operation and Maintenance Manual
10

11 Submittals for project closeout:
12 None
13

14 QUALITY CONTROL:

15
16 Qualifications: Mezzanine shall be furnished by a firm/company qualified, accredited, and regularly
17 engaged in construction of light-gauge steel-framed structures.
18

19 Items of Any One Classification: Items that are used in quantity—such as valves, specialties, accessories,
20 fittings, etc.—shall in each case be the product of one manufacturer and shall be used only for the services
21 recommended by the manufacturer.
22

23 PART 2---PRODUCTS

24 GENERAL:

25
26
27 The Mezzanine System shall be designed to meet IBC and/or BOCA for a light commercial facility. All
28 design calculations and drawings must be prepared under the supervision of a Registered Professional
29 Engineer. Professional Engineer stamps shall be included on all calculations and drawings submitted.
30

31 MATERIALS:

32
33 Mezzanine: All framing components shall be galvanized. The Mezzanine System may butt up to existing
34 building walls. It also may be necessary to work around existing building columns and other obstructions,
35 depending on the subcontractor-supplied metal building system layout. The subcontractor will coordinate
36 mezzanine design and construction with approved metal building shop drawings and shall ensure that the
37 mezzanine will not interfere with the steel building. The mezzanine shall:
38

- 39 • Have a 25 × 10-ft footprint
- 40
- 41 • Have an 8-ft interior ceiling height
- 42
- 43 • Have 1 ft between floors for electrical and mechanical equipment
- 44
- 45 • Provide sufficient clearance within the subcontractor-supplied metal building system to allow
- 46 assembly
- 47 • Include one flashed opening on each floor to the aluminum hung window of the exterior metal
- 48 building, as shown on Drawing A-5

Project Title: **ISB Injection System**
Section Title: **Mezzanine**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

- Include laboratory counters, cabinets, equipment, and fixtures, as shown on Drawing A-5.

Support shall not be provided by exterior metal building walls or columns. Roof shall be insulated to comply with Idaho National Engineering and Environmental Laboratory (INEEL) standards. Walls and ceilings shall be finished with 3/4-in. gypsum board.

Stairs shall be designed to meet IBC, BOCA, and OSHA code requirements. Treads will be solid safety plate.

All mezzanine and stair railing must consist of round tubing and shall be designed to meet strength and rail opening requirements of applicable codes (IBC, BOCA, and OSHA). Railing on the mezzanine will be 3 level and 42 in. to the top of the rail and must include a center handrail. A kickboard also must be included around the landing perimeter.

The mezzanine shall be supplied with all cabinets, counters, sinks (lab and restroom), and fixtures configured as shown on Drawing A-5. The lab sink is to be double basin. The restroom must include a single basin sink and toilet. The lab must include a permanently plumbed eyewash station.

Flooring: Provide and install 12 × 12-in. adhesive commercial vinyl/tile with cove base, Armstrong Imperial Standard Excellon commercial or equal.

PART 3---EXECUTION

GENERAL INSTALLATION OF ALL SYSTEMS:

Mezzanine handling/installation shall follow procedures specified in INEEL standards and shall be set in place, aligned, framed, assembled, and made ready for operation.

Electrical installation: All electrical components and installation shall be in accordance with Section 16000, "Electrical General Provisions," of this specification

Plumbing: Potable water plumbing shall be routed from the potable water source (service location referenced on Drawing P-3) to the lab sink, lab eyewash/shower station, and restroom toilet and sink. Waste plumbing shall be routed from restroom to septic system (service location referenced on Drawing C-3).

CABINETS, COUNTERS, FIXTURES, ETC.:

All laboratory and restroom fixtures shall be set in place, aligned, connected in accordance with the applicable drawing and manufacturer's instructions, and made ready for occupancy and use.

All of the above shall be protected from damage during and after installation. At completion, work shall be free from tool marks, cracks, scratches, chips, and other defects.

Walls and ceilings shall be finished by taping, texturing, and painting. At completion, surfaces shall be uniform and free from tool marks, scratches, cracks, dimples, and other defects.

Project Title: **ISB Injection System**
Section Title: **Mezzanine**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 FIELD QUALITY CONTROL:

2

3 Contractor Inspections: The Contractor's Representative will perform surveillance to verify compliance of
4 the work to the drawings and specifications.

5

6 ATTACHMENTS:

7

8 None.

9

10 END OF SECTION 13121

Project Title: **ISB Injection System**
Section Title: **Electrical General Provisions**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16000 -- ELECTRICAL GENERAL PROVISIONS

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Work Included: The general work associated with electrical systems and equipment and to be performed
8 as part of the electrical contract includes identification, tests, inspections by governing authorities, startup
9 of electrical systems and equipment, operating and maintenance manuals, as built drawings, final cleaning
10 of electrical work, and similar work.

11
12 Wiring and Power Distribution: Incoming service as shown, transformers, panel boards, enclosures,
13 boxes, conduit systems, raceways, cable, wire, wiring devices, overload protection, equipment
14 connections, grounding system, and similar work, all as indicated on the electrical drawings and
15 elsewhere in the contract documents. Power and instrumentation wiring shall be run in separate conduits,
16 conduit runs and panels.

17
18 Lighting: General light fixtures for both interior (fluorescent) and exterior (low-pressure sodium vapor)
19 lighting, including emergency lighting and exit signs.

20
21 Codes and Standards:

22
23 Underwriters Laboratories (UL): All materials, appliances, equipment, or devices shall conform to the
24 applicable standards of Underwriters Laboratories, Inc. All material, appliances, equipment, or devices
25 shall be listed and/or labeled UL.

26
27 National Electrical Code (NEC): All installations and electrical work shall comply with the applicable
28 provisions of the latest edition of the National Electrical Code, NFPA 70.

29
30 Project Record Documents

31
32 Submit under the provisions of the Vendor Data Schedule. All actual installations under this division shall
33 be documented unless otherwise noted in the individual specification. All results of inspections and tests
34 shall be documented and submitted as described in the individual specifications.

35
36 Completed electrical system shall conform to applicable provisions of the Special Conditions, the
37 Technical Specifications, and the subcontract drawings.

38
39 SUBMITTALS:

40
41 Before Final Acceptance:

42 Operational test results of all equipment, controls, and devices installed by the Subcontractor.

Project Title: **ISB Injection System**
Section Title: **Electrical General Provisions**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 PART 2 -- PRODUCTS

2
3 GENERAL:

4
5 Furnish all labor, materials, equipment, and appliances required for the complete the installation of the
6 electrical system. All labor, materials, service, equipment, and workmanship shall conform to the
7 applicable chapters of the NEC, the National Electrical Safety Code (NESC), Occupational Safety and
8 Health Administration (OSHA), and the terms and conditions of the electrical utility. The Subcontractor
9 shall complete all modifications required by these codes, rules, regulations, and authorities without
10 additional charge to the Contractor.

11
12 CONDITION OF PRODUCTS:

13
14 Except as otherwise indicated, furnish new electrical products, free of defects and harmful deterioration at
15 the time of installation. Provide each product complete with trim, accessories, finish, guards, safety
16 devices, and similar components specified or recognized as integral parts of the product or required by
17 governing regulations.

18
19 Unless otherwise indicated by the drawings or specifications or approved in writing, the materials and/or
20 equipment furnished under these specifications shall be the standard products of manufacturers regularly
21 engaged in the production of such equipment and shall be the manufacturer's standard design.

22
23 UNIFORMITY:

24
25 Where multiple units of a product are required for the electrical work, provide identical products by the
26 same manufacturer without variations except for sizes and similar variations as indicated.

27
28 PART 3 -- EXECUTION

29
30 COORDINATION OF ELECTRICAL WORK:

31
32 General: It is recognized that the subcontract documents are diagrammatic in showing certain physical
33 relationships that must be established within the electrical work and in its interface with other work,
34 including utilities and mechanical work, and that such establishment is the exclusive responsibility of the
35 Subcontractor.

36
37 Arrange electrical work in a neat, organized manner with conduit and similar services running parallel
38 with the primary lines of the building construction and with a minimum 7 ft, 0 in. of overhead clearance.

39
40 Locate operating and control equipment properly to provide easy access and working clearance in
41 accordance with the NEC.

42
43 Advise other trades of openings or clearances required in their work for the subsequent move-in and
44 assembly of large units of electrical equipment.

45
46 Electrical connections shall be tightened to torque specifications stated by the equipment manufacturer.
47

Project Title: **ISB Injection System**
Section Title: **Electrical General Provisions**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 QUALITY CONTROL TESTING:

2

3 Subcontractor-Supplied Testing: Upon completing installation of all systems and equipment, but prior to
4 project close out, the Subcontractor shall conduct an operational test of all equipment, controls, and
5 devices installed or modified by the Subcontractor. All equipment shall test satisfactory or be repaired at
6 no additional cost to the Contractor.

7

8 The Subcontractor shall test all devices in the presence of the Contractor's Representative. Subcontractor
9 shall coordinate testing with the Contractor and schedule testing a minimum of 2 weeks in advance of the
10 test. The Subcontractor shall inform the Contractor in writing of the scheduled test to allow the Contractor
11 to designate the Contractor's Representative. This operational testing is in addition to testing required in
12 separate sections of this specification.

13

14 FIELD QUALITY CONTROL:

15

16 The Contractor's Representative will perform surveillance to verify compliance of the work to the
17 drawings and specifications.

18

19 END OF SECTION 16000

Project Title: **ISB Injection System** Project Number: N/A
Section Title: **Switches, Receptacles, and Wall Plates** Revision Date: 01/23/03
Revision Number: 0

1 SECTION 16109 -- SWITCHES, RECEPTACLES, AND WALL PLATES

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install switches and receptacles of sizes, ratings, materials, and types as shown on the
8 drawings.

9
10 Work Included:

11
12 Work includes installing all light switches for interior and exterior lighting and 120 VAC receptacles for
13 the facility (interior and exterior).

14
15 Related Sections:

16
17 Codes and Standards: All equipment provided and the installation of switches, receptacles, and wall plates
18 shall comply with the applicable sections of the following codes and standards:

19
20 NFPA 70 – “National Electrical Code.”

21
22 SUBMITTALS:

23
24 Prior to Purchase:

25 Product data for switches and receptacles

26
27 PART 2 -- PRODUCTS

28
29 MATERIALS:

30
31 Switches: Provide general-duty flush or surface-mounted single-pole toggle switches with mounting yoke
32 insulated from mechanism, equipped with plaster ears, switch handle, and side-wired screw terminals.
33 Switches shall be 20 ampere, 125 VAC rated suitable for use with fluorescent lights. Switches shall be
34 single-pole (double-pole), 3 way or 4 way as indicated by the drawing symbols as shown on the drawings.
35 Where more than one switch is shown at an outlet, switches shall be installed under a gang plate in an
36 order appropriate to the outlet location.

37
38 Switch color shall be ivory.

39
40 Receptacles:

41
42 General-Duty Duplex: Provide duplex general-duty, flush or surface-mounted receptacles, 2-pole,
43 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles
44 internally connected to mounting yoke, 20 ampere, 125 VAC, with metal plaster ears, side wiring,
45 NEMA configuration 5-20R unless otherwise indicated on the drawings.
46

Project Title: **ISB Injection System**
Section Title: **Switches, Receptacles, and Wall Plates** Project Number: N/A
Revision Number: 0 Revision Date: 01/23/03

1 GFCI: Provide general-duty duplex, ground fault circuit interrupter receptacles, feed-through
2 type, capable of protecting connected downstream receptacles on single circuit, ground type, UL
3 rated Class A, Group 1, 20 ampere rating, 125 VAC, 60 Hz; equipped with 20 ampere plug
4 configuration NEMA 5-20R.
5

6 Wall Plates: Provide single switch, single and duplex outlet wall plates for wiring devices, with ganging
7 cutouts as indicated, provide with metal screws for securing plates to devices, screw heads finished to
8 match plate finish.
9

10 PART 3 -- EXECUTION

11 INSTALLATION:

12
13
14 Install receptacles, switches, and wall plates where indicated on the drawings in accordance with
15 recognized industry installation practices.
16

17 Receptacles must be mounted 18 in. from the floor in the facility. Switches must be mounted 48 in. from
18 the floor, unless shown otherwise on the drawings.
19

20 Coordinate with other work including electrical raceway and equipment installation work, as necessary, to
21 interface installation of wiring and devices with other work.
22

23 Install receptacles and switches only in electrical boxes that are clean and free from building materials
24 and debris.
25

26 QUALITY CONTROL TESTING:

27
28 Subcontractor-Supplied Testing: Perform visual inspections to determine that equipment installation
29 conforms to NEC, these specifications, and the drawings.
30

31 FIELD QUALITY CONTROL:

32
33 The Contractor's Representative will perform surveillance to ensure compliance with these drawings and
34 specifications.
35

36 END OF SECTION 16109

Project Title: **ISB Injection System**
Section Title: **Electrical Raceways**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16110 -- ELECTRICAL RACEWAYS

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install electrical raceways of types, grades, and sizes as shown on the drawings. Provide
8 complete assembly of raceways including, but not necessarily limited to, couplings, elbows, adapters,
9 hold-down straps, and other components and accessories as needed for a complete system.

10
11 Coordinate with other work as necessary to interface installation of electrical raceways and components
12 with other work.

13
14 Work Included:

15
16 Work includes installing all raceways as shown on the drawings. These raceways—primarily conduits—
17 include, but are not limited to, metal conduit, flexible metal conduit, electrical metallic conduit,
18 nonmetallic conduit, electrical nonmetallic tubing, flexible nonmetallic conduit, fittings, conduit bodies,
19 and wire ways.

20
21 Related Sections:

22
23 Section 16000 – “General Electrical Provisions”

24
25 Section 16450 – “Grounding”

26
27 Codes and Standards: All equipment provided and the installation of electrical raceways shall comply
28 with the applicable sections of the following codes and standards:

29
30 ANSI C80.1 – “Rigid Steel Conduit, Zinc Coated”

31
32 ANSI C80.3 – “Electrical Metallic Tubing, Zinc Coated”

33
34 ANSI C80.5 – “Rigid Aluminum Conduit”

35
36 NECA – “Standard of Installation”

37
38 NEMA FB 1 – “Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies”

39
40 NEMA RN 1 – “Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and
41 Intermediate Metal Conduit”

42
43 NEMA TC 2 – “Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)”

44
45 NEMA TC 3 – “PVC Fittings for Use with Rigid PVC Conduit and Tubing”

46
47 NEMA WD 6 – “Wiring Device Configurations”

48
49 NFPA 70 – “National Electric Code”

Project Title: **ISB Injection System**
Section Title: **Electrical Raceways**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SUBMITTALS:

2
3 Prior to Purchase:

4
5 Provide product data for metallic conduit and tubing, flexible metallic and nonmetallic conduit,
6 nonmetallic (PVC) conduit and tubing, liquid-tight flexible conduit, fittings, and conduit bodies.

7
8 Before Final Acceptance:

9
10 Submit as-built drawings showing actual conduit routing.

11
12 PART 2 -- PRODUCTS

13
14 MATERIALS:

15
16 Conduit and Fittings: Rigid metal conduit or IMC shall be used for all conductors where outside, buried
17 in earth, in masonry, in concrete, and in damp or wet locations. All conduit shall be UL approved, ¾ in.
18 minimum unless shown otherwise on the drawings. All conduit, fittings, and bodies shall meet the
19 appropriate nationally recognized standard and shall be UL listed.

20
21 Polyvinyl chloride (PVC) conduit shall be heavy wall, Schedule 40, rated 90°C. The PVC may be used
22 for fire alarms, underground feeders, and branch circuits installed under floor slabs. If PVC conduit is
23 used, a stranded copper ground conductor shall be installed in accordance with the NEC. All underground
24 bends, of 30 degrees or more, shall be rigid, galvanized steel conduit.

25
26 All bends shall be completely below finished floor for under floor conduit runs.

27
28 Electrical metallic tubing (EMT) shall be installed only in the office area. The remaining areas shall be
29 stipulated for rigid conduit or IMC. The EMT shall be UL approved, standard weight, electro-galvanized
30 steel, and be a minimum of ¾ in. in size.

31
32 Outdoor above-grade installations shall be rigid steel or aluminum conduit.

33
34 Flexible metal conduit shall be installed in dry locations unless shown otherwise on the drawings.

35
36 Liquid-tight, flexible conduit shall be installed in wet locations. Liquid-tight flex shall be grounding-type
37 with PVC jacket. Wet locations will consist of the process piping area only.

38
39 Conduit fittings for rigid conduit shall be rust-resistant cast steel.

40
41 Conduit fittings for EMT shall be steel, rain-tight compression type.

42
43 All junction boxes shall be galvanized unless shown otherwise.

44
45 Small junction boxes (4 11/16 in. square and smaller) shall be stamped from one piece of sheet steel and
46 shall be galvanized.

47

Project Title: **ISB Injection System**
Section Title: **Electrical Raceways**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 PART 3 -- EXECUTION

2
3 INSTALLATION:

4
5 Install conduit, tubing, and duct products as indicated on the drawings in accordance with manufacturer's
6 written instructions, applicable requirements of NEC and National Electrical Contractors Association's
7 "Standard of Installation," and complying with recognized industry practices to ensure that products serve
8 intended functions.

9
10 All conduits shall be supported using coated steel or malleable iron straps, lay-in adjustable hangers,
11 clevis hangers, and split hangers. Supports shall be arranged to prevent misalignment during wiring
12 installation. Conduit supports shall be fastened to building structures and surfaces and not to ceiling
13 support wires. Conduit shall not be supported with wire or perforated pipe straps. Remove all wire used as
14 temporary supports.

15
16 Where mounting channel is used, all exposed ends shall be capped.

17
18 Conduit shall be installed to maintain headroom and present a neat appearance. Route the exposed conduit
19 parallel and perpendicular to walls. Conduit installed above accessible ceilings shall be routed parallel
20 and perpendicular to walls. Conduit installed in and under slab shall be from point-to-point and shall not
21 be crossed. Adequate clearance shall be maintained between conduit and piping. A minimum of 12 in.
22 clearance shall be maintained between conduit and surfaces with temperatures exceeding 104°F (40°C).

23
24 Provide flexible conduit for all motor connections and for other electrical equipment connections where
25 subject to vibration or movement.

26
27 Provide liquid-tight flexible conduit for connections of motors and for other electrical equipment where
28 subject to movement or vibration, and where subject to one or more of the following conditions:

29
30 Exterior locations

31
32 Moist or humid atmosphere where condensate can be expected to accumulate.

33
34 All conduit joints shall be cut square, threaded, reamed smooth, and drawn up wrench tight. Bends of
35 offsets shall be made with standard conduit bending dies that will not injure or flatten the pipe.

36
37 Rigid conduit terminating at cabinets and boxes shall be rigidly secured with locknuts inside and outside
38 and with an insulated-type grounding bushing.

39
40 Male threads on exterior runs of galvanized steel conduit shall be thoroughly coated with conducting
41 sealing media such as petroleum-based products. No red lead shall be used on any conduit joint.

42
43 All conduit penetrations through building walls, firewalls, or floors shall be grouted around outside of
44 conduits. Conduits penetrating exterior walls shall be internally weather sealed. Conduits two in. or
45 greater, passing through fire floors, shall have UL- or FM-approved internal fire seals.

46
47 Ground and bond the conduit under the provisions of Section 16450.

Project Title: **ISB Injection System**
Section Title: **Electrical Raceways**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 CONDUIT IDENTIFICATION:
2

3 All conduits shall be identified by a self-adhesive Brady label encircling the conduit and a legend of the
4 conductor characteristics (example - 480 V, 3 ph, VP for voice paging, FA for fire alarm, and EVAC for
5 evacuation) in black letters within 3 ft of enclosures. Exposed electrical conduit shall be identified at
6 intervals not to exceed 20 ft and at least once in each room.
7

8 QUALITY CONTROL TESTING:
9

10 Subcontractor-Supplied Testing: Perform visual inspections to determine that equipment installation
11 conforms to NEC, these specifications, and the drawings.
12

13 FIELD QUALITY CONTROL:
14

15 The Contractor's Representative will conduct surveillance to ensure compliance with the drawings and
16 specifications.
17

18 END OF SECTION 16110

Project Title: **ISB Injection System**
Section Title: **Cable, Wire, Connectors, and
Miscellaneous Devices**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16120 -- CABLE, WIRE, CONNECTORS, AND MISCELLANEOUS DEVICES

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install cables, wire, and wiring connectors of sizes, ratings, materials, and types as shown on
8 the drawings.

9
10 Work Included:

11
12 Work includes, but is not limited to, installing all cables, wire, and wiring connectors as shown on the
13 drawings.

14
15 Related Sections:

16
17 Section 16000 – “Electrical General Provisions”

18
19 Codes and Standards: All equipment provided and the installation of cables, wires, connectors, and
20 miscellaneous devices shall comply with the applicable sections of the following codes and standards:

21
22 NFPA 70 – “National Electrical Code”

23
24 SUBMITTALS:

25
26 Prior to Purchase:

27
28 Submit product data for all wiring, cables, and connectors.

29
30 Before Final Acceptance:

31
32 Submit cable insulating resistance test results for all cables over 400 V.

33 Submit electrical continuity test results of all conductors over 400 V.

34
35 PART 2 -- PRODUCTS

36
37 MATERIALS:

38
39 600-V Wiring:

40
41 Conductors for power and lighting branch circuits shall not be smaller than No. 12 AWG.

42
43 Conductors shall be stranded for all sizes of wire and cable larger than No. 10 AWG.

44
45 Conductors shall be copper for all sizes.

46
47 Wire insulation shall be type THHN/THWN for all 600-V conductors unless otherwise specified.

Project Title: **ISB Injection System**
Section Title: **Cable, Wire, Connectors, and
Miscellaneous Devices**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Wiring shall be color coded as indicated below:
2

3 Conductors:
4

<u>System</u>	<u>Phase A</u>	<u>Phase B</u>	<u>Phase C</u>	<u>Neutral</u>	<u>Ground</u>
208/120	Black	Red	Blue	White	Green
480/277	Yellow	Orange	Brown	Gray	Green

5
6 For large conductors not generally furnished with colored insulation, phase identification shall be
7 achieved by the use of plastic tape or sleeves of the appropriate color. Yellow phase tape shall consist of
8 two separate bands at each application point in order to avoid confusion with white, gray, or orange after
9 aging. All wire markers and phase tape shall be covered by clear heat shrink sleeving to protect the
10 markings.

11
12 CONNECTORS:

13
14 Spring-type pressure connectors, such as Scotchlock, shall be used for splicing No. 8 AWG and smaller.

15
16 Splitbolt and/or lug-type connectors such as Burndy shall be used for splicing No. 6 AWG and larger.

17
18 Crimp on spade or ring tongue lug connectors for connection to terminal boards such as Stakon@ shall be
19 used.

20
21 Wire/Device Identification: All conductors shall be identified with self-adhering, oil- and moisture-
22 resistant vinyl labels, covered with clear heat shrink tubing or white heat shrink tubing with black typed-
23 on letters with nonsmearing ink as manufactured by Brady, T&B, or approved equal. Hand-lettered labels
24 shall not be used. All conductors shall be labeled with point-to-point destination, as shown on the
25 drawings. Identification and labeling shall comply with the appropriate provisions of Section 16000.

26
27 PART 3 -- EXECUTION

28
29 INSTALLATION:

30
31 General: Install electrical cable, wire, and connectors as indicated on the drawings, in accordance with
32 manufacturer's written instructions, applicable requirements of NEC and National Electric Contractors
33 Association's "Standard of Installation," and in accordance with recognized industry practices to ensure
34 products serve intended function.

35
36 Coordinate cable and wire installation work with electrical raceway and equipment installation work, as
37 necessary for proper interface.

38
39 Pull conductors together where more than one is being installed in a raceway. Do not exceed the
40 conductor manufacturer's recommended pulling tension.

41
42 Use pulling compound or lubricant, where necessary; pulling compound shall not deteriorate conductor
43 insulation.

Project Title: **ISB Injection System**
Section Title: **Cable, Wire, Connectors, and
Miscellaneous Devices**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Keep conductor splices to a minimum. Splices shall not be located in conduit or associated conduit fitting.

2
3 Install splices and taps that have mechanical strength and insulation rating equivalent-or-better than
4 conductor.

5
6 Use splice and tap connectors that are compatible with conductor material.

7
8 QUALITY CONTROL TESTING:

9
10 Subcontractor-Supplied Testing:

11
12 Meggering: Prior to terminating, test all cable or wire (for connections greater than 400 V) for insulation
13 resistance with megger (1,000-V megger for 600-V insulation). Any wire or conductor with less than
14 10 megohms to ground shall be replaced before proceeding with termination. List the conductors tested
15 on required test data submittal sheet.

16
17 Electrical Continuity: After conductor connectors (for connections greater than 400 V) are installed and
18 conductors are labeled, but prior to termination to terminals or devices, an electrical continuity test shall
19 be performed on each conductor using a battery-powered buzzer or ohmmeter to determine that all power,
20 control, grounding, and other conductors are properly installed and identified. List all conductors tested
21 on required test data submittal sheets. Subcontractor personnel must be on hand to support testing as
22 needed. The Contractor's Representative shall provide the Test Data Submittal Sheets.

23
24 FIELD QUALITY CONTROL:

25
26 The Contractor's Representative will conduct surveillance to ensure compliance with the drawings and
27 these specifications.

28
29 END OF SECTION 16120

Project Title: **ISB Injection System**
Section Title: **Panelboards**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16160 -- PANELBOARDS

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install distribution and power panelboards of sizes, ratings, materials, and types as shown on
8 the panel schedules. Panelboards shall be equipped with thermal-magnetic, molded case circuit breakers
9 of trip ratings as shown on the panel schedules.

10
11 Work Included:

12
13 Work includes, but is not limited to, furnishing and installing the panelboards shown on drawings and
14 specifications including the enclosures, bus bars, breakers, covers, circuit directories, and wire labeling
15 (as required). Terminate all conductors inside enclosures. All panelboards, especially those where
16 knockouts have been pulled or holes sawed in the enclosure, shall be thoroughly cleaned and vacuumed to
17 ensure that all metal scraps and shreds are removed before the cover is installed.

18
19 Related Sections:

20
21 Section 16000 – “Electrical General Provisions”

22
23 Section 16450 – “Grounding”

24
25 Codes and Standards: All equipment provided and the installation of panelboards shall comply with the
26 applicable sections of the following codes and standards:

27
28 NECA - (National Electrical Contractors Association) “Standard of Installation”

29
30 NEMA 250 – “Enclosures for Electrical Equipment (1,000 Volts Maximum)”

31
32 NEMA AB 1 – “Molded Case Circuit Breakers”

33
34 NEMA ICS 2 – “Industrial Control Devices, Controllers and Assemblies”

35
36 NEMA ICS 4 – “Terminal Blocks for Industrial Control Equipment and Systems”

37
38 NEMA KS 1 – “Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)”

39
40 NEMA PB 1 – “Panelboards”

41
42 NEMA PB 1.1 – “Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated
43 600 Volts or Less”

44
45 NETA ATS - (International Electrical Testing Association) “Acceptance Testing Specification for
46 Electrical Power Distribution Equipment”

47
48 NFPA 70 – “National Electrical Code”

Project Title: **ISB Injection System**
Section Title: **Panelboards**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SUBMITTALS:

2
3 Prior to Purchase:

4
5 Submit shop drawings, indicating outline and support point dimensions, voltage, main bus ampacity,
6 integrated short circuit ampere rating, circuit breaker, and fusible switch arrangement and sizes.

7
8 Before Final Acceptance:

9
10 Submit as-built drawings showing actual locations of panelboards and circuit arrangements.
11 Submit steady-state load current test results.
12 Submit breaker inspection and test results.

13
14 PART 2 -- PRODUCTS

15
16 MATERIALS:

17
18 Bussing Assembly and Temperature Rise: All bussing shall be copper. Panelboard bus structure and main
19 lugs or main breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be
20 established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to
21 exceed a 50°C rise above ambient. Heat rise tests shall be conducted in accordance with UL Standard 67.
22 The use of conductor dimensions will not be accepted in lieu of actual tests. All panelboards shall have a
23 ground bus and a neutral bus installed.

24
25 Fusible Switch Assemblies: Fusible switch assemblies shall meet the requirements of Standard NEMA
26 KS 1. They shall be quick-make, quick-break, load interrupter enclosed knife switches with an externally
27 operable handle. Interlocks shall be provided to prevent opening the front cover with the switch in the ON
28 position. The handle shall be lockable in the OFF position. The fuse clips shall be designed to
29 accommodate Class R fuses.

30
31 Molded Case Circuit Breakers: Circuit breakers shall meet the requirements of Standard NEMA AB 1
32 with integral thermal and instantaneous magnetic trip in each pole. Circuit breakers shall be equipped
33 with individually insulated, braced, and protected connectors. The front faces of all circuit breakers shall
34 be flush with each other. Large, permanent, and individual circuit numbers shall be affixed to each
35 breaker in a uniform position. Tripped indication shall be clearly shown by the breaker handle taking a
36 position between ON and OFF. Provisions for locking each breaker in the open position shall be
37 provided. Provisions for additional breakers shall be such that no additional connectors will be required to
38 add the breakers.

39
40 Integrated Equipment Short Circuit Rating: Each panelboard, as a complete unit, shall have a factory-
41 established short circuit current rating equal to or greater than the integrated equipment rating shown on
42 the panelboard schedule or on the drawings. Short circuit current rating shall be established by the factory
43 testing with the overcurrent devices mounted in the panelboard. The short circuit tests on the overcurrent
44 devices in the panelboard structure shall be made simultaneously by connecting the fault to each
45 overcurrent device with the panelboard connected to its rated voltage source. Method of testing shall be in
46 accordance with UL Standard 67. The source shall be capable of supplying the specified panelboard short
47 circuit current or greater. Factory testing of panelboard overcurrent devices for short circuit rating only
48 while individually mounted is not acceptable. Also, testing of the bus structure by applying a fixed fault

Project Title: **ISB Injection System**
Section Title: **Panelboards**
Revision Number: 0

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1 to the bus structure alone is not acceptable. Panelboards shall be factory marked with their maximum
2 short circuit current rating at the supply voltage and shall be UL listed.

3
4 Cabinet: Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel shall be
5 specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL
6 Standard 67. An interior metal panel for mounting terminal blocks and electrical components shall be
7 provided. Cabinets shall be equipped with latch and tumbler-type lock on door of trim. Doors over 48 in.
8 long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Two keys
9 shall be furnished. As required, metal barriers to form separate compartments for wiring of different
10 systems and voltages shall be provided. End walls shall be removable. Finish shall be gray backed enamel
11 electro-deposited over clean, phosphatized steel. A circuit directory frame and card with clear plastic
12 covering shall be provided on the inside of the door. The directory shall be typed by the Subcontractor
13 and shall indicate the area and function served by each breaker.

14
15 Safety Barriers: The panelboard interior assembly shall be dead front with the panelboard front removed.
16 Main lugs or main breakers shall have barriers on five sides. The barrier in front of the main lugs shall be
17 hinged to the fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

18
19
20 UL Listing: Panelboards shall be listed by Underwriters Laboratories and shall bear the UL label. When
21 required, panelboards shall be suitable for and marked for use as service equipment in orange letters.

22
23 Hinged Cover Enclosures: Hinged cover enclosures for interior use shall be constructed in accordance
24 with NEMA 250, Type 1 steel enclosures. The covers shall be a continuous hinge, held closed by key and
25 supplied with two keys. An interior metal panel for mounting terminal blocks and electrical components
26 shall be provided.

27
28 Terminal Blocks: Terminal blocks shall be NEMA ICS 4. Power terminals shall be unit construction type
29 with closed back and tubular pressure screw connectors, rated at 600 V. Signal and control terminals shall
30 be modular construction type suitable for channel mounting with tubular pressure screw connectors rated
31 at 300 V. A ground bus terminal block, with each connector bonded to the enclosure, shall be provided.

32 33 PART 3 -- EXECUTION

34 35 INSTALLATION:

36
37 Install panelboards as indicated on the drawings and in accordance with manufacturer's written
38 instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard
39 of Installation," and complying with recognized industry practices to ensure that the products serve their
40 intended function.

41
42 Provide filler plates for unused spaces in panelboards. Provide typed circuit director for each branch
43 circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads. Provide
44 engraved nameplates under the provision of Section 16000.

45
46 Ground and bond the panelboard enclosures according to Section 16450.

47

Project Title: **ISB Injection System**
Section Title: **Panelboards**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 QUALITY CONTROL TESTING:

2
3 Subcontractor-Supplied Testing: Perform visual inspection to determine that equipment installed
4 conforms to NEC, these specifications, and the drawings. Measure steady-state load currents at each panel
5 board feeder; rearrange circuits in the panelboard to balance the phase loads to within 20% of each other.
6 Maintain proper phasing for multiwire branch circuits.

7
8 Inspect and test in accordance with NETA ATS, except Section 4, as listed in Section 7.4 and Section 7.5
9 (for circuit breakers). Report results. The Contractor will witness tests and must be notified in writing
10 7 days in advance of Subcontractor testing.

11
12 FIELD QUALITY CONTROL:

13
14 The Contractor's Representative will conduct surveillances to ensure compliance of the work with the
15 drawings and specifications.

16
17 END OF SECTION 16160

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16195--ELECTRICAL IDENTIFICATION

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall provide and install labels and identification as specified in this document and on
8 the associated drawings. See electrical drawings for equipment identifiers.

9
10 Section Includes, but is not limited to:

11
12 Install labels on electrical and related equipment, including the following:

- 13
14 Wires
15 Cables
16 J-Boxes
17 Switches
18 Receptacles
19 Panels
20 Disconnects
21 MCCs
22 PCCs
23 Load centers.

24
25 Label major and subfed breakers for MCCs, PCCs, load centers, and substation.

26
27 Related Sections:

- 28
29 16000 "General Electrical Provisions"
30 16120 "Cable, Wire, Connectors, and Miscellaneous Devices"

31
32 REFERENCES:

33
34 The following documents, including others referenced therein, form part of this section to the extent
35 designated herein. See the list of general electrical references in Section 16000.

- 36
37 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
38 ANSI A13.1 "Scheme for the Identification of Piping Systems"

39
40 SUBMITTALS:

41
42 See Section 16000 and the Vendor Data Schedule for additional submittal requirements.

43
44 QUALITY CONTROL:

45
46 Regulatory Requirements (Codes and Standards): Comply with provisions of the following codes and
47 standards unless otherwise specified herein.

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
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1 ANSI Standard A13.1 with regard to type and size of lettering for raceway and cable labels.
2 NFPA 70, "National Electric Code"

3
4 PART 2--PRODUCTS

5
6 MATERIALS:

7
8 Adhesive Marking Labels for Raceway and Metal-Clad Cable: Pre-printed, flexible, self-adhesive labels
9 with legend, identifying system type, or voltage and phase.

10
11 Wire and Cable Designation Tape Markers: Self-adhering, oil- and moisture-resistant vinyl labels covered
12 with clear heat shrink tubing. Letters shall be typed in black, nonsmearing ink. Hand-lettered labels shall
13 not be used. Engraved identification tags may also be used.

14
15 Brass, Steel, or Aluminum Tags: Metal tags with stamped legend and punched holes for fastener.
16 Dimensions: minimum 2 in. × 2 in. × 19 gauge with ¼-in. radius corners and 3/16-in. hole for fastener.

17
18 Brass and Steel Labels: Black engraving and 3/16-in. holes punched in corners. Dimensions: 0.31 to
19 0.50 in. thick with ¼-in. radius corners.

20
21 Engraved, Plastic-Laminated Labels, Tags, Signs, and Instruction Plates: Engraving stock melamine
22 plastic laminate, 1/16-in. minimum thick for signs up to 20 in.², or 8 in. in length; 1/8-in. thick for larger
23 sizes. Engraved legend and punched for mechanical fasteners.

24
25 Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, non-fading, pre-printed
26 cellulose acetate, butyrate signs with 20-gauge galvanized steel backing, with colors, legend, and size
27 appropriate to the location. Provide ¼-in. grommets in corners for mounting.

28
29 Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or Number 6/32
30 galvanized steel machine screws with nuts, flat washers, and lock washers. Signs and labels shall be glued
31 in place using clean GE Silicone II adhesive. Duplex receptacles and light switches shall be glued on
32 only. Labels larger than 1 in. high × 2 in. long shall be glued and screwed on.

33
34 LABEL MAKEUP, CONTENT, SIZE, AND LETTERING:

35
36 Labels for Electrical Equipment:

37
38 General: Labels are to be made from materials that are compatible with the application. Brass or
39 stainless steel shall be used when indicated on the drawings.

40
41 Equipment Label Content: Include the following, as applicable, on electrical power-distribution
42 equipment labels:

- 43
44 1. Properly assigned identifier (as shown on drawings)
45 2. Noun name or function description
46 3. Designation on system designator as assigned by the Idaho Nuclear Technology and Engineering
47 Center (INTEC) (See reference drawing.)
48 4. Equipment inventory number

Project Title: **ISB Injection System**
 Section Title: **Electrical Identification**
 Revision Number: 0

Project Number: N/A
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5. Voltage and the number of phases
6. Power source (fed from) equipment identifier
7. Circuit number (if applicable)
8. Building in which power source is located (if different from equipment location)
9. Transformer and disconnect switch labels shall contain the destination (fed to) power equipment identifier fed by the transformer secondary or disconnect switch.

Example Panel Labels: S-LP-WL-3901
 LIGHTING PANEL, 408/277V, 3 PHASE
 FED FROM: PANEL EP-2, CKT 2, WMF-603

N-PP-WL-3901
 POWER PANEL, 480/277V, 3 PHASE
 FED FROM: TRANSFORMER N-XFR-3901

Example Transformer Label: N-XFR-WL-3901
 TRANSFORMER
 ED FROM: SECTIONALIZER ST-2
 FEEDS: PANEL N-PP-3901

Example Disconnect Label: N-DS-WL-3901
 DISCONNECT SWITCH
 FED FROM: PANEL N-PP-3901, CKT 4
 FEEDS: HEATER HV-EHTR-3903

Equipment Label Colors: Background and legend colors for electrical equipment labels shall be as specified in Table 1 below.

Table 1. Electrical equipment label colors.

Power System Classification	Power System Designator	Background Color	Legend Color
Normal	N	Black	White
Standby	S	Yellow	Black
Emergency	E	White	Red
UPS	U	White	Red
Regulated	R	Same as source	Same as source
Direct current	DC	Black	White

Equipment Label and Lettering Size: Electrical equipment label and lettering size shall be as specified in Table 2. If equipment size constraints make the specified label size impractical, the label and lettering size will be as large as possible for that particular equipment application.

Project Title: **ISB Injection System**
 Section Title: **Electrical Identification**
 Revision Number: 0

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1 Table 2. Electrical equipment label sizes.

Table Power Equipment Classification	Label Height (Minimum)	Lettering Height First Line	Lettering Height Subsequent Lines
Primary Distribution Equipment	2-1/2 in.	3/4 in.	3/8 in.
Secondary Power Distribution Switches Disconnect Switches	1 in.	3/8 in.	1/4 in.
Power Distribution Panels	1 in.	1/2 in.	1/4 in.
Power Distribution Transformers	2 in.	1/2 in.	1/4 in.
PCC/MCC Switchgear Switchboards	2 in.	3/4 in.	3/8 in.
Power Receptacles	3/8 in.	3/16 in.	N/A

2
 3 Labels for Light Switches and Receptacles: Labels shall be engraved plastic laminate. Labeling and
 4 lettering sizes shall be as specified in Table 2 above. Labeling shall be consistent with subcontract
 5 documents.

6
 7 Example Light Switch and Single Phase Receptacle Label: N-LP-3901 CKT 2, 120 V

8
 9 Three-Phase Receptacles: Three-phase power/welding receptacle labels shall include identifier,
 10 voltage, source power panel, and circuit number.

11
 12 Example Three-Phase Receptacle Label: N-RCP-3901, 480 V
 13 FED FROM: N-PP-3901, CKT 4

14
 15 Identification and Labels for Circuits, Cables, and Wire: The method of identification shall be as follows:

16
 17 Panelboard Breakers: Label single-pole breakers with the single-pole space numbers. Label double pole
 18 breakers with the first number of the two single spaces they occupy. Label three pole breakers with the
 19 first number of the three single spaces they occupy.

20
 21 For example, a three-pole breaker in Spaces 1, 3, and 5 shall be labeled breaker No. 1. A two-pole breaker
 22 in Spaces 7 and 9 shall be labeled No. 7. A single pole breaker in Space 11 shall be labeled No. 11. Install
 23 a type-written circuit directory in each panel and furnish a copy to the Contractor.

24
 25 Conductors: Conductor identification shall include the following:

- 26
 27 1. Panel identifier
 28 2. Circuit identification number from the panel with the destination equipment identifier
 29 3. Voltage.
 30

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
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1 Example Conductor Label: A conductor from S-PP-2301, circuit No. 4, to S-DS-3901 would be
2 identified with the identification number S-PP-2301-4/S-DS-3901, 120 V.
3

4 Below Grade Power Circuit Identification: Fasten identifying tags securely to cables, feeders, power
5 circuits in vaults, pull boxes, and junction boxes. Tags shall have engraved legend corresponding with
6 designations in specifications and drawings. Attach tags with approximately 55-lb test monofilament
7 line or one-piece self-locking nylon cable ties. Tag cables at each entry and exit of the manhole or
8 once in a pull box or J-Box.
9

10 Conductor Color-Coding: Provide color-coding for secondary service, feeder, and branch circuit
11 conductors throughout the project's secondary electrical system as specified in Section 16120.
12

13 Conduit Labels:

14
15 General: Identify conduit with a label attached parallel to or encircling the conduit. The label shall
16 show a legend of the conductor characteristics, including the following:
17

- 18 1. Highest voltage level contained within the conduit
- 19 2. AC or DC current
- 20 3. Number of phases
- 21 4. Service type (FA for Fire Alarm, ENS for Emergency Notification, VP for Voice Paging, EVAC
22 for Evacuation), if applicable.
23

24 Example Conduit Label: 120 V, AC, 1 Ph, FA.
25

26 Label Color: Conduit labels shall be color-coded as specified in Table 3 below:
27

28 Table 3. Conduit label colors.

Power Type	Background Color	Lettering Color
Normal Power	Orange	Black
Standby Power	Yellow	Black
Emergency Power	White	Red

29
30 Labeling Size and Placement: The minimum letter height for content and identification labels of raceways
31 and conduit shall be as specified in Table 4 below. A letter size of at least one half the trade diameter is
32 recommended for conduit. The label shall be as long as required to display the specified information.
33

34 Table 4. Conduit label sizes.

Raceway or Conduit Size (in.)	Minimum Height of Lettering (in.)
¾ to 1-¼	½
1-½ to 2	¾
2-½ to 6	1-¼
8 to 10	2-½
Over 10	3-½

35 Note: Size refers to the nominal diameter for conduit or the width of the raceway or cable tray.

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 High-Voltage Feeders: Identify high-voltage (over 600 V) feeder conduit by the words "DANGER-HIGH
2 VOLTAGE" in black letters 2 in. high, stenciled at 10-ft intervals over a continuous painted orange
3 background.

4
5 PART 3--EXECUTION

6
7 INSTALLATION:

8
9 General: Install equipment/system circuit/device identification as follows:

10
11 Apply equipment identification labels of engraved plastic-laminate on electrical equipment, including the
12 central or master unit of each electrical system and each subbreaker or controller. This includes medium-
13 and low-voltage power distribution/communication/signal/alarm systems. Match the text to terminology
14 and numbering of the subcontract documents and shop drawings. Apply labels for each unit of the
15 categories of electrical work listed below:

- 16
17 1. Panelboards, electrical cabinets, and enclosures
18 2. Access doors and panels for concealed electrical items
19 3. Motor starters and MCC main cabinets
20 4. Power transfer equipment
21 5. Contractors
22 6. Control devices
23 7. Components, wires, and cables
24 8. Disconnect and safety switches
25 9. Transformers
26 10. Fire alarm control panel
27 11. Receptacles
28 12. Light switches
29 13. Light fixtures
30 14. Power Control Centers (PCCs) and each subbreaker.

31
32 Apply circuit/control/item designation labels of engraved plastic laminate for items listed below:

- 33
34 1. Disconnect switches
35 2. Breakers
36 3. Motor controllers
37 4. Motor control centers
38 5. Substation and load centers
39 6. Similar items for power distribution and control components listed above.

40
41 For panelboards, provide and install a framed and typed circuit schedule (directory) with explicit
42 description and identification of items controlled by each individual breaker. Furnish a copy of the panel
43 directory to the Contractor.

44
45 Install labels at indicated locations as well as convenient viewing locations, free of obstructions and
46 interference from operations and maintenance equipment.

47
48 Sequence of Work: If identification is to be applied to surfaces that require a finish, then install
49 identification after the finish work is completed.

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Identification and Labeling of Electrical Equipment: Attach equipment label(s) on the front of electrical
2 equipment in as visible a location as possible. Use separate labels to identify cautions or dangers required
3 by code and as designated on the drawings.
4

5 Labeling of Light Switches and Receptacles: Light switches and single-phase receptacles shall be labeled
6 to identify the source power panel, circuit number, and voltage. Attach labels securely on or at each
7 receptacle. Use construction adhesive GE Silicone II to glue labels to the cover.
8

9 Identification and Labeling of Fire Alarm and Supervisory Equipment: Label fire alarm and supervisory
10 equipment in accordance with Specification 16721, "Fire Alarm and Supervisory System."
11

12 Identification and Labeling of Circuits, Cables, and Wire: Each individual circuit breaker in a panelboard
13 shall be clearly identified by a circuit number appropriate to the individual panelboard. Identify circuits,
14 breakers, or spaces that are spare, blank, or utilized for power distribution on the panel legend provided
15 by the Subcontractor or manufacturer.
16

17 Conductors to 120-V light switches and 120-V duplex receptacles do NOT need to be labeled.
18

19 Label individual switchgear cubicles/cells.
20

21 Each conductor or cable shall be clearly identified and labeled in electrical pull boxes or junction boxes.
22 Engraved, laminated plastic identification tags are acceptable for this purpose when attached to each
23 conductor.
24

25 Label exposed cables used for power distribution or instrumentation with the assigned identification
26 number no less than every 100 ft for the total length of the cable. Individual conductors used for overhead
27 power distribution shall be labeled at each termination point.
28

29 If field-applied conductor color-coding is used, apply colored, pressure-sensitive plastic tape in half-
30 lapped turns for a distance of 6 in. from terminal points and in boxes where splices or taps are made.
31 Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-in.-wide tape in
32 colors as specified. Apply yellow phase tape consisting of two separate bands at each application point to
33 avoid confusion with white, gray, or orange after aging. Do NOT obliterate or obstruct any cable
34 identification markings when taping. Adjust tape locations slightly to prevent such visual obstructions.
35 All wire markers and phase tape shall be covered by clear heat shrink sleeving.
36

37 Below Grade Power Circuit Identification: Securely fasten identifying tags to cables, feeders, and power
38 circuits in vaults, pull boxes, and junction boxes. Tags shall have an engraved legend corresponding with
39 designations in specifications and drawings. Attach tags with either monofilament line, approximately
40 55-lb test, or one-piece of self-locking nylon cable tie. Tag cables at each entry and exit of the manhole or
41 once in a pull box or J-Box.
42

43 Conduit Labeling: Exposed raceways and conduits shall be labeled within 3 ft of the power source,
44 adjacent to process equipment, and adjacent to each side of any penetration through floors, walls, or
45 bulkheads. Place labels at intervals NOT to exceed 20 ft on straight runs of conduit.
46

47 Raceways and conduit shall be labeled at least once in each room through which they pass. For ease of
48 identification, apply labels in a convenient and obvious location. Conduction ceiling space above
49 suspended ceilings shall be labeled.

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 High-Voltage Feeders: The following areas shall be identified:
2

- 3 1. Exposed wall surfaces in close proximity to enclosed conduit running concealed within such walls
4 2. The entire surface of exposed conduit.
5

6 Apply identification to areas as follows:
7

- 8 1. Clean surface of dust, loose material, and oily films before painting
9 2. Prime surfaces
10 3. For galvanized metal, use single-component acrylic-vehicle-coating, formulated specifically for
11 galvanized surfaces
12 4. For concrete masonry units, use heavy-duty acrylic-resin block filler
13 5. For concrete surfaces, use clear alkali-resistant alkyd binder-type sealer
14 6. Apply one intermediate and one finish coat of orange-silicone alkyd enamel
15 7. Apply primer and finish materials in accordance with manufacturer's instructions.
16

17 Labeling of Manholes and Handholes: Manholes and handholes shall have the properly assigned identifier
18 indicated on the cover (see drawings for identifiers).
19

20 Label inside of manhole walls with a 6-in.-high black letter stenciled onto the concrete wall,
21 approximately centered on the wall.
22

23 Label each wall with N for north, E for east, W for west, and S for south to match survey coordinates.
24

25 Label inside of manhole entry with number label for the manhole, as shown on the drawings.
26

27 Manhole entry label shall be 3 in. high with letters and numbers stenciled in black ink or paint.
28

29 Identification labels shall be permanently displayed on the cover (of the manhole, handhole, etc.) so they
30 will be legible over the design life of the installation. Markings may be welded to, machined-in,
31 engraved-in, or a metal tag bolted to the cover. Lettering shall be in capital letters.
32

33 Content Labels: Ensure that the covers of handholes, manholes, or similar access to operational
34 equipment have the contents clearly identified. Keep content legends specific and as brief as possible
35 (ELECTRIC, COMMUNICATIONS, etc). Write content legends in English.
36

37 Warning, Caution, and Instruction Signs: Install warning, caution, and instruction signs as follows:
38

- 39 1. Where required by NEC
40 2. As indicated on the drawings
41 3. Where required to ensure safe operations and maintenance of electrical systems and of the items
42 to which they connect
43 4. Engraved plastic-laminated instruction signs displaying instructions, explanations, cautions,
44 dangers, or warnings personnel may need for the safe operation of the specific system or
45 equipment being operated
46 5. Butyrate signs with metal backing for outdoor locations.
47

48 Identify Junction and Connection Boxes: Code-required caution sign for boxes shall be a
49 pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange

Project Title: **ISB Injection System**
Section Title: **Electrical Identification**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 background. Attach labels on the outside of the box cover. Mount an engraved plastic laminate label,
2 identifying the circuits contained in the box, to the box cover. For exposed locations, use pressure-
3 sensitive plastic labels. Use similar labels and tags for concealed boxes.

4
5 FIELD QUALITY CONTROL:

6
7 Contractor Inspection: The Contractor's Representative will perform surveillance to verify compliance of
8 the work to the drawings and specifications.

9
10 END OF SECTION 16195

Project Title: **ISB Injection System**
Section Title: **Disconnect Switches**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16360 -- DISCONNECT SWITCHES

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install disconnect switches of sizes, grades, and types as shown on the drawings. Provide
8 complete assembly including hubs, fuses, and other components and accessories as needed for complete
9 system.

10
11 Work Included:

12
13 Work includes, but is not limited to, furnishing and installing the electrical disconnect switches as shown
14 on drawings and specifications including the hubs, fuses, and other components and accessories needed
15 for a complete system.

16
17 Related Sections:

18
19 Section 16000 – “General Electrical Provisions”

20
21 Codes and Standards: All equipment provided and the installation of disconnect switches shall comply
22 with the applicable sections of the following codes and standards:

23
24 NFPA 70 – “National Electrical Code”

25
26 SUBMITTALS:

27
28 Submit disconnect switch product data prior to purchase.

29
30 PART 2 -- PRODUCTS

31
32 MATERIALS:

33
34 Disconnects: Disconnect switches shall be NEMA type, heavy duty, single throw, fuses or non-fused, and
35 have current and voltage ratings as shown on the drawings.

36
37 Switches shall be operated with external operating handle, which is an integral part of the box, not the
38 cover. The operating mechanism shall be quick-make, quick-break, and shall not be capable of being
39 restrained by the operating handle during the opening and closing operation.

40
41 Dual interlocks shall interlock the switch box cover with the switch mechanism and shall prevent opening
42 or closing the box cover when the switch contacts are closed and the switch mechanism is in the ON
43 position. An interlock release shall be provided to defeat the interlocking mechanism and to permit
44 opening the box cover when the switch contacts are closed. The box cover shall require an external tool to
45 defeat the interlock release and permit opening.

46
47 Switch handles shall be designed for padlocking in the OFF position, locking the door closed to inhibit
48 access to the switch. All current-carrying metal parts of the switch shall be enclosed.

Project Title: **ISB Injection System**
Section Title: **Disconnect Switches**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 PART 3 -- EXECUTION

2
3 INSTALLATION:

4
5 Install disconnect switches as indicated on the drawings and in accordance with manufacturer's written
6 instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard
7 of Installation," and complying with recognized industry practices to ensure that products serve their
8 intended function.

9
10 Install disconnecting devices associated with motors, and other pieces of equipment, within sight of the
11 device where practical, or unless otherwise indicated on the drawings. All disconnecting devices shall be
12 clearly labeled to distinguish which motor/piece of equipment it disconnects.

13
14 QUALITY CONTROL TESTING:

15
16 Subcontractor-Supplied Testing: Perform visual inspection to determine that equipment installed
17 conforms to NEC, these specifications, and the drawings.

18
19 FIELD QUALITY CONTROL:

20
21 The Contractor's Representative will conduct surveillance to ensure compliance of the work with the
22 drawings and specifications.

23
24 END OF SECTION 16360

Project Title: **ISB Injection System**
Section Title: **Grounding**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16450 -- GROUNDING

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install grounding of types, ratings, materials, and sizes as shown on the drawings.

8
9 Work Included:

10
11 Work includes, but is not limited to, furnishing and installing the grounding as shown on drawings and
12 specifications including the grid wire, grounding rods, ground bars, other components, and accessories
13 needed for a complete system.

14
15 Related Sections:

16
17 Section 16000 – “General Electrical Provisions”

18
19 Codes and Standards: All equipment provided and the installation of the grounding system shall comply
20 with the applicable sections of the following codes and standards:

21
22 ANSI C2 – “National Electric Safety Code”

23
24 NETA ATS - (International Electrical Testing Association) “Acceptance Testing Specification for
25 Electrical Power Distribution Equipment and Systems”

26
27 NFPA 70 – “National Electrical Code”

28
29 SUBMITTALS:

30
31 Submit manufacturer’s data for grounding electrodes and connections prior to purchase.

32
33 Submit reports of inspections and tests, and of overall resistance to ground and resistance to each
34 electrode, before final acceptance.

35
36 Submit as-built drawings showing actual location of components and grounding electrodes before final
37 acceptance.

38
39 PART 2 -- PRODUCTS

40
41 MATERIALS:

42
43 Grounding grid wire shall be a minimum of No. 4 AWG bare-stranded copper sized and located as shown
44 on the drawings.

45
46 Ground rods shall be a minimum of 3/4-in.-diameter and 10-ft-long copper clad steel.
47

Project Title: **ISB Injection System**
Section Title: **Grounding**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Ground grid connections below grade shall be made by the exothermic welding process. Exothermic
2 welds shall be Cadweld or approved equal. UL-listed compression fittings will be considered approved
3 equal to exothermic welds.
4

5 Equipment ground conductors shall be green insulated or bare copper sized and located as shown on the
6 drawings.
7

8 PART 3 -- EXECUTION

9 INSTALLATION:

10 Install a complete grounding system as indicated on the drawings and in accordance with applicable
11 requirements of NEC and National Electrical Contractors Association's "Standard of Installation," and
12 complying with recognized industry practices to ensure that products serve their intended function.
13
14

15 All exposed non-current-carrying metallic parts of electrical equipment, raceways, building steel, and
16 neutral conductors of the wiring system shall be grounded.
17
18

19 Grounding Grid: A grounding grid shall be sized and provided around the periphery of the building as
20 shown on the drawings. The grounding grid shall be a minimum of 30 in. below finished grade.
21

22 All underground metallic water piping, all building structural steel (in particular, building corner
23 columns), rebar, and underground metallic conduit and ground cables shall be connected to the building
24 ground grid. These connections to the ground grid shall be exothermically welded or UL-listed
25 compression fitting.
26

27 Cathodically protected piping or conduit shall not be connected to the ground grid.
28

29 Conduit shall not be used as the ground conductor.
30

31 Ground Rods: Ground rods shall be driven around the building adjacent to the ground grid and connected
32 thereto. The ground rods shall be driven so that the top of the rod is 1 ft below finished grade.
33

34 Exothermic Welds: Exothermic welds shall be made in accordance with the manufacturer's written
35 recommendations.
36

37 QUALITY CONTROL TESTING:

38
39 Subcontractor-Supplied Testing: Perform visual inspection to determine that the grounding installation
40 conforms to NEC, these specifications, and the drawings. Test and inspect the grounding system in
41 accordance with NETA ATS, except Section 4. Perform and document inspections and tests listed in
42 NETA ATS, Section 7.13. Subcontractor personnel must be on hand to support testing, as needed.
43

44 FIELD QUALITY CONTROL:

45
46 The Contractor's Representative will conduct surveillances to ensure compliance with the drawings and
47 specifications.
48

49 END OF SECTION 16450

Project Title: **ISB Injection System**
Section Title: **Transformers, General Lighting, and Distribution Dry Type, Indoor and Outdoor, Under 600V**
Revision Number: 0
Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16460 --TRANSFORMERS, GENERAL LIGHTING, AND DISTRIBUTION DRY TYPE,
2 INDOOR AND OUTDOOR, UNDER 600V

3
4 PART 1 -- GENERAL

5
6 WORK DESCRIPTION:

7
8 Provide and install transformers of sizes, ratings, and types as shown on the drawings. Transformer
9 construction will be in accordance with this specification.

10
11 Work Included:

12
13 Work includes, but is not limited to, furnishing and installing the various sizes and descriptions of
14 transformers shown on drawings and installed in the locations indicated in compliance with these
15 specifications, all provisions of the NEC, NESC, and AE Standards as to clearances, grounding, location,
16 local disconnects, NEMA ratings, and load balancing whether or not those things are shown in exact
17 detail on the drawings.

18
19 Related Sections:

20
21 Section 16110 – “Electrical Raceways”

22
23 Section 16450 – “Grounding”

24
25 Codes and Standards: All equipment provided and the installation of dry-type transformers shall comply
26 with the applicable sections of the following codes and standards:

27
28 NEMA ST 1 – “Specialty Transformers (Except General-Purpose Type)”

29
30 NEMA ST 20 – “Dry-Type Transformers for General Applications”

31
32 NETA ATS - (International Electrical Testing Association) “Acceptance Testing Specification for
33 Electrical Power Distribution Equipment”

34
35 NFPA 70 – “National Electrical Code”

36
37 SUBMITTALS:

38
39 Submit product data that provide outline and support point dimensions of enclosures and accessories, unit
40 weight, voltage, kVA, impedance ratings and characteristics, tap configurations, insulation
41 system type, and rated temperature rise prior to purchase.

42
43 Before Final Acceptance:

44
45 Submit test reports indicating loss data, efficiency, and sound level readings at 25, 50, 75, and 100 percent
46 rated load. Submit other test reports as identified.

Project Title: **ISB Injection System**
Section Title: **Transformers, General Lighting, and Distribution Dry Type, Indoor and Outdoor, Under 600V** Project Number: N/A
Revision Number: 0 Revision Date: 01/23/03

1 Submit manufacturer's installation instructions. Indicate application conditions and limitations of use
2 stipulated by Underwriters Laboratory, Inc. or testing firm acceptable to the authority having jurisdiction
3 as suitable for the purpose specified and indicated. Include instructions for storage, handling, protection,
4 examination, preparation, and installation of product.

5
6 Submit as-built drawings indicating actual location of transformers and transformer hookup.

7
8 PART 2 -- PRODUCTS

9
10 MATERIALS:

11
12 Single-phase transformers shall be 480 V primary and 120/240 V, 3-wire secondary. Three-phase
13 transformers shall be 480-V delta primary and 208Y/120-V Wye, 4-wire secondary.

14
15 Transformers less than 15 kVA shall have two 2.5% below-rated voltage and two 2.5% above-rated
16 voltage full capacity taps on the primary windings. Transformers 15 kVA and larger shall have winding
17 taps in accordance with NEMA ST 20. Transformers 25 kVA and larger shall have a minimum of four
18 22% full-capacity primary taps—two above- and two below-rated voltage. Rated voltages shall be
19 designated on the drawings.

20
21 Transformers 15 kVA and below shall be Class 185 with 115°C temperature rise, and transformers
22 16 kVA and above shall be Class 220 with 150°C temperature rise above ambient, 30°C. All insulating
23 systems shall be in accordance with NEMA Standard ST 20 factory-assembled air-cooled dry type
24 transformers.

25
26 Transformer coils shall be of the continuous wound construction and shall be impregnated with
27 nonhydropscopic, thermosetting varnish with terminations brazed or welded.

28
29 All cores shall be constructed of high-grade, nonaging silicon steel with high-magnetic permeability and
30 low hysteresis and eddy current losses. Magnetic flux densities must be kept well below the saturation
31 point. The core laminations shall be clamped together with structural steel angles. The completed core
32 and coil shall then be bolted to the base of the enclosure but isolated therefrom by means of rubber,
33 vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the
34 enclosure. On transformers 500 kVA and smaller, the vibration isolating system shall be designed to
35 provide a permanent fastening of the core and coil to the enclosure.

36
37 Transformers 15 kVA and larger shall be in a ventilated sheet steel enclosure of a heavy gauge, as
38 described in the NEMA standards. The ventilating openings shall be designed to prevent accidental access
39 to live parts in accordance with UL, NEMA, and NEC standards for ventilated enclosures. Single-phase
40 transformers through 75 kVA and three-phase transformers through 45 kVA shall be designed so they can
41 be either floor or wall mounted. Single-phase transformers larger than 75 kVA and three-phase
42 transformers larger than 45 kVA shall be floor-mounted design.

43
44 The entire transformer enclosure shall be de-greased, cleaned, phosphatized, primed, and finished with
45 gray, baked enamel.

46
47 The maximum temperature of the top of the enclosure shall not exceed 50°C rise above ambient of 30°C.

Project Title: **ISB Injection System**
Section Title: **Transformers, General Lighting, and Distribution Dry Type, Indoor and Outdoor, Under 600V** Project Number: N/A
Revision Number: 0 Revision Date: 01/23/03

1 The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding
2 conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.

3
4 Sound levels shall be guaranteed by the manufacturer not to exceed the following:

5
6

1 to 5 kVA:	40 dB
15 to 50 kVA:	45 dB
51 to 150 kVA:	50 dB
151 to 300 kVA:	55 dB
301 to 500 kVA:	60 dB

7
8
9
10

11
12 Basic impulse level shall be 10 kV for transformers less than 300 kVA.

13
14 The transformer shall be listed by Underwriters' Laboratory for the specified temperature rise.

15
16 **PART 3 -- EXECUTION**

17
18 **INSTALLATION:**

19
20 Install transformers as indicated on the drawings and in accordance with applicable manufacturer's
21 written instructions, applicable requirements of NEC and National Electrical Contractors Association's
22 "Standard of Installation," and complying with recognized industry practices to ensure that products serve
23 their intended function.

24
25 Mount wall-mounted transformers using integral flanges or accessory brackets furnished by manufacturer.
26 Mount floor-mounted transformers on vibration-isolating pads suitable for isolating the transformer noise
27 from the building structure. All mounting brackets, seismic restraints, and similar accessories shall be
28 supplied by the manufacturer.

29
30 Provide grounding and bonding in accordance with Section 16450.

31
32 **QUALITY CONTROL TESTING:**

33
34 **Subcontractor-Supplied Testing:** Perform visual inspection to determine that the equipment installation
35 conforms to NEC, these specifications, and the drawings.

36
37 Inspect and test in accordance with NETA ATS, except Section 4, and as listed in Section 7.2. Measure
38 primary and secondary voltages and make appropriate tap adjustments. The Contractor will witness tests
39 and must be notified in writing 7 days in advance of Subcontractor testing.

40
41 **FIELD QUALITY CONTROL:**

42
43 The Contractor's Representative will conduct surveillances to ensure compliance with the drawings and
44 specifications.

45
46 END OF SECTION 16460

Project Title: **ISB Injection System**
Section Title: **Lighting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SECTION 16500 -- LIGHTING

2
3 PART 1 -- GENERAL

4
5 WORK DESCRIPTION:

6
7 Provide and install lighting fixtures of sizes, ratings, and types as shown on the drawings. Provide
8 complete lighting system consisting of lamps, lamp holders, reflectors, ballasts, starters, and wiring.

9
10 Work Included:

11
12 Work includes, but is not limited to, furnishing and installing the interior and exterior lighting system as
13 shown on drawings and specifications including the lamps, lamp holders, reflectors, ballasts, starters,
14 wiring, emergency lighting units, exit signs, and other components and accessories needed for a complete
15 system.

16
17 Related Sections:

18
19 16109 – “Switches, Receptacles, and Wall Plates”

20
21 16110 – “Electrical Raceways”

22
23 16120 – “Cable Wire, Connectors, and Miscellaneous Devices”

24
25 16450 – “Grounding”

26
27 Codes and Standards: All equipment provided and the installation of lighting shall comply with the
28 applicable sections of the following codes and standards:

29
30 ANSI C78.379 – “Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps -
31 Classification of Beam Patterns”

32
33 ANSI C82.1 – “Ballasts for Fluorescent Lamps - Specification”

34
35 ANSI C82.4 – “Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply
36 Type)”

37
38 ANSI/IES RP-7 – “Practice for Industrial Lighting”

39
40 *IES Lighting Handbook*

41
42 NEMA WD 6 – “Wiring Devices-Dimensional Requirements”

43
44 NFPA 70 – “National Electrical Code”

45
46 NFPA 101 – “Life Safety Code”

47

Project Title: **ISB Injection System**
Section Title: **Lighting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 SUBMITTALS:

2
3 Prior to Purchase:

4
5 Submit Shop Drawings. Indicate dimensions and components for each luminary that is not a standard
6 product of the manufacturer.

7
8 Submit Product Data. Provide dimensions, ratings, and performance data.

9
10 Prior to Construction Start:

11
12 Submit Manufacturer's Installation Instructions. Indicate applicable conditions and limitations of use
13 stipulated by Underwriters laboratory, Inc. or testing firm acceptable to the authority having
14 jurisdiction as suitable for purpose specified and indicated. Include instructions for storage, handling,
15 protection, examination, preparation, and installation of each product.

16
17 Before Final Acceptance:

18
19 Submit manufacturer's operation and maintenance instructions for each product.

20
21 Submit test reports. Measure and document the illumination levels for the middle of the facility, at the
22 walls of the facility, and the external perimeter 5 ft from the facility walls.

23
24 PART 2 -- PRODUCTS

25
26 MATERIALS:

27
28 Ballasts: All ballasts shall be of the high-power factor, high efficiency, class P type, suitable to light in
29 cold weather; their design and construction shall conform to Certified Ballast Manufacturer's standards.
30 Ballasts shall be nonasphaltic thermosetting compound compatible with any contaminated fluid. Ballasts
31 shall not contain polychlorinated biphenyls (PCBs) and shall be maximum sound level B. Ballast for
32 fluorescent lamps shall conform to ANSI C82.1; ballast for low-pressure sodium (exterior lamps) shall
33 conform to ANSI C82.4. Ballasts shall be electronic.

34
35 Fixtures: Interior lamps and fixtures shall be two or four bulb, 32 W, T8, 120 V fluorescent, as indicated;
36 facility exterior lamps and fixtures (at the access doors) shall be 70 W low-pressure sodium vapor lamps.
37 Provide low-temperature electronic ballasts suitable for the lamp specified. External fixtures shall be
38 equipped with "dark-sky" compliant photocells.

39
40 All fluorescent fixtures shall be wired from outlet boxes with No. 12 AWG, Type CF fixture or Type
41 THHN wire.

42
43 All low-pressure sodium-vapor exterior fixtures shall be wired from sealed outlet boxes with No. 12
44 AWG THHN wire. Fixtures shall be area flood type, clear glass covers with gasketing between frame and
45 luminary body. Mounting shall be at the eaves on the exterior of the building.

46
47 Emergency Lighting Units: Emergency lighting units shall be self-contained fluorescent units. The battery
48 shall be 12 V, lead calcium type with 1.5-hour capacity. The battery charger shall be a dual-rate type with

Project Title: **ISB Injection System**
Section Title: **Lighting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 sufficient capacity to recharge a discharged battery to full charge within 12 hours. The lamps shall be
2 instant-start compact fluorescent. Each unit shall be equipped with indicating lights to indicate AC ON
3 and RECHARGING. The units shall be furnished with a test switch that transfers from external power
4 supply to integral battery supply. The electrical connection shall be conduit. External power shall be
5 120 VAC.
6

7 Exit Signs: The exit sign fixture shall be suitable for use as an emergency lighting unit and may be of the
8 light emitting diode (LED) type. The face shall be translucent plastic with red letters on a white
9 background. Directional arrows and mounting shall be universal type for field adjustment. Lamps shall be
10 manufacturer's standard. The battery, battery charger, test switch, and external power shall be as
11 described above.
12

13 PART 3 -- EXECUTION

14 INSTALLATION:

15
16
17 Install lighting fixtures of types and ratings as indicated on the drawings and in accordance with
18 manufacturer's written instructions, applicable requirements of NEC and the National Electrical
19 Contractors Association's "Standards of Installation," and complying with recognized industry practices
20 to ensure that the products serve their intended functions.
21

22 Provide and install all fixtures, lamps, and tubes of the types and wattages indicated along with the
23 necessary equipment for supporting the hanging of all light fixtures. Fasten fixtures securely to indicated
24 structural support members of the building in accordance with UCB Seismic Zone 2b requirements with
25 Importance Factor of 2.0; ensure that all pendent fixtures are plumb.
26

27 Install suspended fixtures and exit signs using pendants supported from swivel hangers. Provide pendant
28 length required to suspend fixtures at indicated height.
29

30 Bond the products and metal accessories to the branch circuit equipment's grounding conductor.
31

32 ADJUST AND CLEAN:

33
34 Clean lighting fixtures of dirt and debris upon completion of installation.
35

36 Aim and adjust luminaries to provide illumination levels and distribution, as directed.
37

38 Protect installed fixtures from damage during the remainder of construction.
39

40 QUALITY CONTROL TESTING:

41
42 Subcontractor-Supplied Testing: Upon completion of installation of lighting fixtures, and after building
43 circuitry has been energized, apply electrical energy to demonstrate lighting capability and compliance
44 with requirements. Replace bulbs or tubes that are noticeably dim, correct malfunctioning units at site,
45 and then re-test to demonstrate compliance; otherwise, remove and replace with new units, and proceed
46 with re-testing.
47

Project Title: **ISB Injection System**
Section Title: **Lighting**
Revision Number: 0

Project Number: N/A
Revision Date: 01/23/03

1 Measure and record the illumination levels. Take measurements during night sky, without moon or with
2 heavy overcast clouds effectively obscuring moon.

3

4 FIELD QUALITY CONTROL:

5

6 The Contractor's Representative will conduct surveillances to ensure compliance with the drawings and
7 specifications.

8

9 END OF SECTION 16500

Appendix D
In Situ Bioremediation Well Drilling Specifications

In-Situ Bioremediation Well Drilling Specification

In-Situ Bioremediation Well Drilling Specification

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**Prepared for the
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ACRONYMS

ASTM	American Society for Testing and Materials
bls	below land surface
CFR	Code of Federal Regulations
DOT	Department of Transportation
INEEL	Idaho National Engineering and Environmental Laboratory
ISB	in-situ bioremediation
MCP	Management Control Procedure
NFC	National Fire Code
NFPA	National Fire Protection Association
OU	operable unit
TAN	Test Area North
TSF	Technical Support Facility
USGS	United States Geological Survey

In-Situ Bioremediation Well Drilling Specification

1. INTRODUCTION

This specification identifies and describes the installation and completion of three wells to be installed in support of the In-Situ Bioremediation (ISB) remedial action at Test Area North (TAN), Operable Unit (OU) 1-07B at the Idaho National Engineering and Environmental Laboratory (INEEL). The wells are identified as TAN-59, -60, and -61.

1.1 Site Location

Figure 1-1 shows the proposed locations for the three new wells. Well TAN-59 (the new injection well) will be drilled approximately 23-m (75-ft) from TSF-05 towards TAN-37. Well TAN-60 (PMW-1) will be drilled approximately 40-m (130-ft) northwest of TAN-30A. Well TAN-61 (PMW-2) will be drilled approximately 40-m (130-ft) south of TAN-30A. The exact drilling locations for these wells will be established by the OUI-07B project personnel prior to the start of drilling.

1.2 Site Background

The geology beneath TAN is characterized by basalt flows intercalated with sedimentary interbeds. Basalt flows are highly variable, from dense to highly vesicular and from massive to highly fractured. Sedimentary interbeds vary in thickness, with a median thickness of about 1.2-m (4-ft), generally thinner than interbeds found elsewhere on the INEEL. Two main interbeds, P-Q and Q-R, consist primarily of silt and clay. The P-Q interbed dips to the south such that the depth to the interbed varies from about 58-m (190-ft) below land surface (bls) near TSF-05, to about 104-m (340-ft.) bls at well TAN-24a. The P-Q interbed is laterally extensive, but not continuous, and is only encountered in about half of the wells that are drilled to a depth where it would be expected. Depth to the Q-R interbed is approximately 134-m (440-ft) bls, with a thickness of about 2.6-m (12-ft). The Q-R interbed appears to be laterally continuous in the area surrounding TAN and effectively confines contaminants within the aquifer. A more complete description of the geology, hydrogeology, and groundwater contamination at TAN is found in the TAN site conceptual model reports.

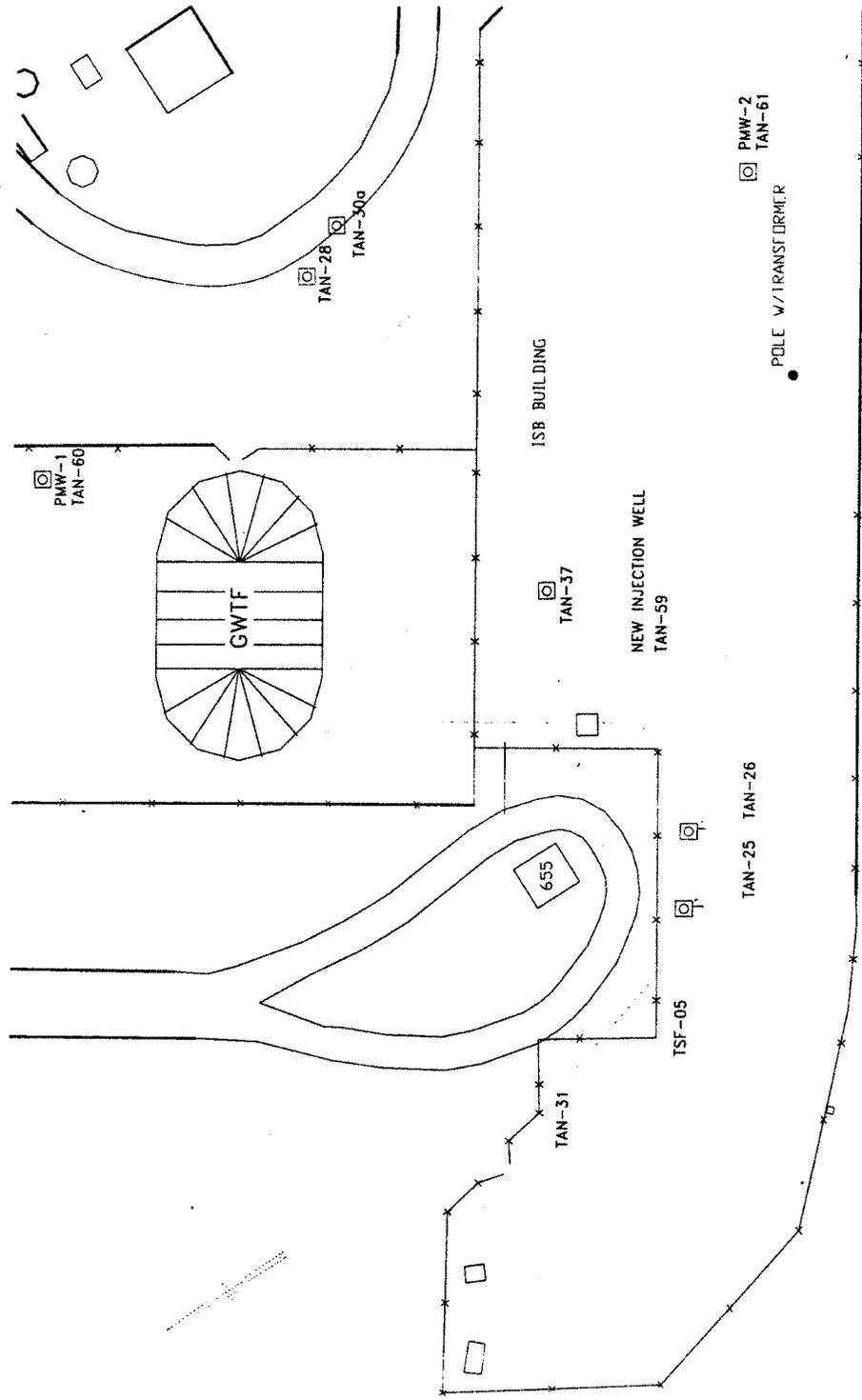


Figure 1-1. Well location map.

2. SCOPE OF WORK

This section describes the well configuration drilling activities and materials needed for the ISB wells.

2.1 Well Configuration and Drilling Activities

Wells TAN-59, -60, and -61 are to be drilled and completed as shown in Table 2-1. Drilling will continue at each well location until it reaches the Q-R interbed. All wells will be cased to just above the water table, approximately 59-m (195-ft) bls, with an open borehole below that depth as shown in Figure 2-1. Well TAN-59 will be used as an injection well for the ISB Injection System.

Table 2-1. Well construction summary.

Well Name	Hole Diameter (in.)	Hole Depth ^a (ft)	Casing Interval (ft)	Casing Diameter (in)
TAN-59	20	0-50	+3-50 ^b	16
	14 ¾	50-195	+2-195	10
	9 7/8	195-300	Open Hole	NA
TAN-60	20	0-50	+3-50 ^b	16
	14 ¾	50-195	+2-195	10
	9 7/8	195-440	Open Hole	NA
TAN-61	20	0-50	+3-50 ^b	16
	14 ¾	50-195	+2-195	10
	9 7/8	195-440	Open Hole	NA

a. Hole depths are approximate. Total depth will be dependent on depth to the Q-R interbed.

b. Surface casing depth must be at least 1.5-m (5-ft) into competent basalt, but not less than 5.6-m (20-ft) bls.

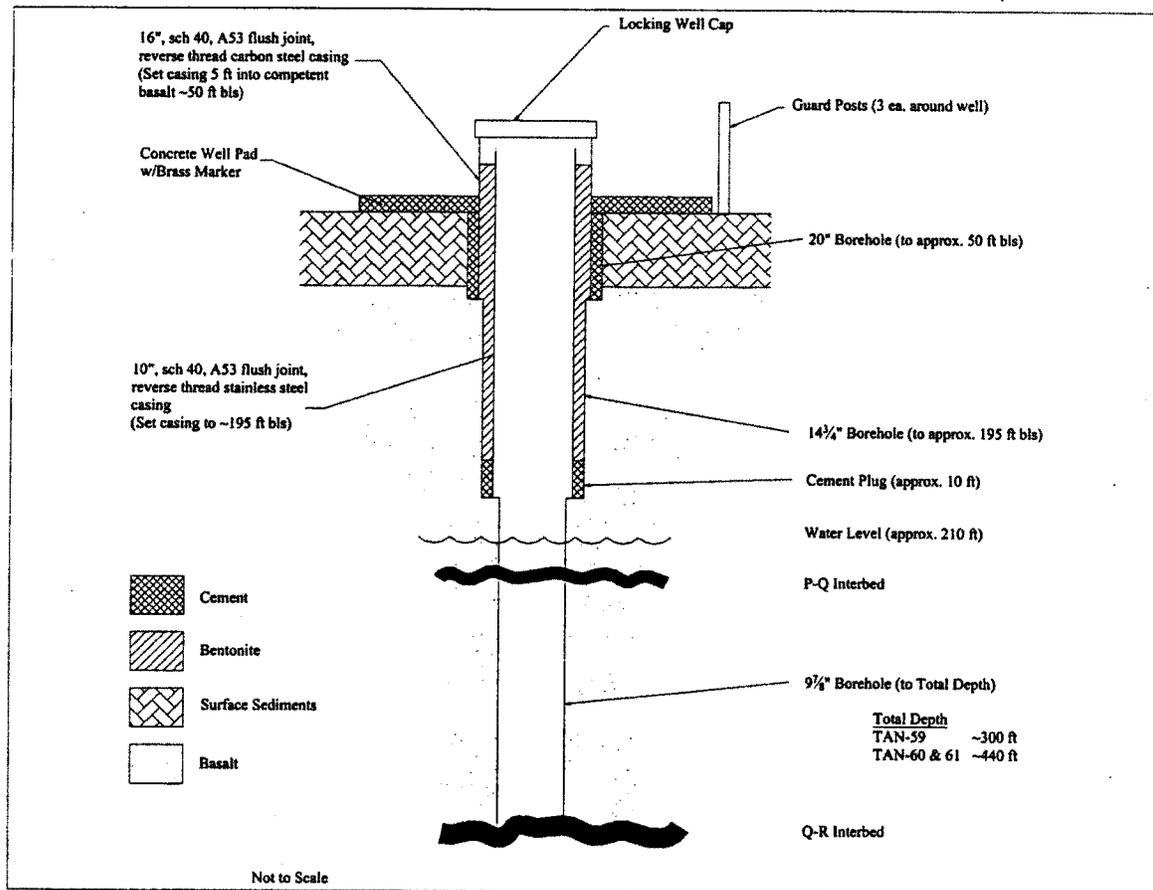


Figure 2-1. Conceptual well design for TAN-59, TAN-60 and TAN-61.

2.1.2 Drilling Activities

A summary of the drilling activities related to all three wells is provided as follows:

1. Using reverse circulation drilling techniques with a down-hole hammer and button bit, drill a 50.8-cm (20-in.) diameter borehole in the alluvial sediments from the land surface to a depth of at least 1.5-m (5-ft) into competent basalt (approximately 15-m [50-ft], but not less than 6.6-m [20-ft]), and install 40.6-cm (16-in.) left hand thread, flush joint (Schedule 40) carbon steel casing (ASTM A53) provided by the Subcontractor. Samples of the drill cuttings will be collected for lithologic information at a 1.5-m (5-ft) interval during all well drilling activities.
2. Grout the 40.6-cm (16-in.) casing in place by filling the annulus between the casing and the rock formation with a grout mixture of Type 1 Portland cement, 5% granular sodium bentonite, and 26 to 34 L (7-9 gal) of water per 43-kg (94-lb) bag of cement. Grout shall be allowed to cure for a minimum of 12 hours before further drilling of the borehole will continue. Grout and any other annular fill material will be installed using a tremmie pipe, unless otherwise specified.
3. Drill a 37.5-cm (14 3/4-in) diameter borehole to just above the water table (approximately 59-m [195-ft] bls).
4. Upon reaching a depth of 59-m (195-ft) bls, the drill string will be tripped from the borehole to allow for geophysical logging of the borehole by the US Geological Survey (USGS). Geophysical logs that will be run include caliper log, natural gamma log, deviation log, and video log.
5. Following logging activities, install 25.4 (10-in.) flush joint, left hand thread (Schedule 40) stainless steel casing (ASTM A53) provided by the Subcontractor. Seal the 25.4-cm (10-in) steel casing in place by filling the annulus between the casing and the rock formation with Type I Portland cement, 5% granular sodium bentonite, and 26 to 34 L (7-9 gal) of water per 43-kg (94-lb) bag of cement to approximately 10 ft. from bottom of the casing. Seal the remaining annulus between the casing and the rock formation with Number 8 sodium bentonite chips.
6. After drilling to a depth of approximately 59-m (195-ft) bls, Groundwater containment devices will be put in place. Following installation of the containment devices, a 23-cm (9 7/8-in) diameter borehole shall be advanced until water is produced. At this point, water sampling will be performed. After sampling is completed, continue drilling a 25-cm (9 7/8-in) diameter borehole until reaching the target depth.
7. After reaching total depth, excess drill cuttings shall be cleaned from the borehole. The well shall be developed until drill cuttings and fine sediments are removed, and water visibly clears. The wells shall not be over drilled to accommodate excess drill cuttings.
8. Upon drilling a 25-cm (9 7/8-in) diameter borehole to total depth, geophysical borehole logging may be completed by the USGS. The drill string shall remain in the borehole until logging activities have been completed so that logging tools may be run within the drill string. Geophysical logs that will be run include a neutron log, a gamma-gamma log, a natural gamma log, and a deviation log.

9. At the completion of drilling activities, the well completion activities will be completed as described in Section 2.5.
10. Upon completion of the well, the Subcontractor shall install a locking well cap on the surface casing.
11. Boreholes must not deviate more than 3 degrees from the vertical. Any borehole exceeding the 3-degree deviation will be abandoned in accordance with state requirements and Management Control Procedure (MCP)-226 "Well Construction/Well Abandonment."

2.2 Well Construction Materials

The following well casing and well completion accessories will be needed for each well:

- A sufficient quantity of 40.6-cm (16-in) flush-joint, left hand thread Type A53 (Schedule 40) carbon steel casing
- A sufficient quantity of 25.4-cm (10-in) flush-joint, left hand thread Type A53 (Schedule 40) stainless steel casing
- Locking well cap for each well
- A sufficient quantity of 23-kg (50-lb) bags of Number 8 granular sodium bentonite with a bulk density of at least 46 kg/ft³ (80 lb/ft³)
- A sufficient quantity of Type I Portland cement the Subcontractor will provide, in 43-kg (94-lb) bags and/or by premixed cement batches delivered to the site via cement trucks, depending on the quantity required
- A sufficient quantity of 4" and 5" Schedule 40 CS Pipe to be used for guard posts.

Note: For 25.4-cm (10-in) stainless steel casing, 6-m (20-ft) sections may be used. However, at least one 3-m (10-ft) section of stainless steel casing should be supplied for each well. The 25.4-cm (10-in) nominal stainless steel well casing must be factory precleaned (steam cleaned).

2.3 Miscellaneous Drilling Information

1. Drilling mixtures, other than air or air/water, will not be used during drilling of the well.
2. All downhole drilling equipment will be cleaned using a steam cleaner on a decontamination pad which will be provided by the Subcontractor prior to initiating any drilling. All downhole equipment may also be decontaminated at the completion of each well, and will be decontaminated prior to demobilization from the site. Downhole equipment (drill rods, drill bits, etc.) will be decontaminated over a decontamination pad in order to remove potential contamination. Decontamination activities will proceed in accordance with the procedures described in INEEL/EXT-97-01287, "Interim Decontamination Plan for OU 1-07B," (INEEL 2002a).

2.4 Grouting

All grout except abandonment or lost circulation grout, shall be a grout mixture of Type I cement, 5% granular sodium bentonite, and 25- to 34-L (7- to 9-gal) of water per 430-kg (94-lb) bag of cement. A maximum of 1:1 ratio of sand or pea gravel to cement may be added to the grout mixture to reduce grout loss.

Abandonment and lost circulation grout may consist of approximately 50% Type II Portland cement; 2% granular bentonite (2% by weight relative to the dry cement, approximately 0.9-kg [2-lb] of bentonite per 43-kg [94-lb] sack of cement); and approximately 48% sand. Curing accelerators (e.g., CaCl) may be added.

2.5 Well Site Completion

Well site completion (protective casing, well pad, guard posts, brass marker) will be the responsibility of the Subcontractor. Final drill site cleanup activities will include the following: smooth out ruts from drilling activities, smooth out (aboveground) drill cuttings, removing all drilling equipment and materials from the drill site, removing all related barricades and fencing materials, and restoring the site as it was prior to drilling. Final completion will include the installation of a concrete well pad with brass marker and guard posts. The brass marker shall identify the well name and list the INEEL Coordinates and elevation. These items shall be installed in accordance with INEEL Drawing No. 520454.

3. VENDOR DATA AND MISCELLANEOUS SUBCONTRACTOR EQUIPMENT REQUIREMENTS

3.1 Vendor Data Submittal

The following vendor data submittals for approval are required:

- Description of dust suppression methods
- Temporary containment device at the well head, and diverter devices that will prevent groundwater produced by the drilling operation from reaching the ground surface.
- Well completion accessories (catalog cuts/product data) for each of the following:
 - Casing
 - Bentonite
 - Cement
 - Tremmie pipe
 - Cement basket
- The latest inspection on masts and hoisting tools, load rating charts, and load test certification (must be within 12 months of drilling start date)
- The manufacturer's specifications and recommendations concerning masts, hoists, and other equipment
- Personnel/operator qualifications – each drilling rig shall have one employee on site with a valid Idaho well driller/supervisors license. In addition, all drill helpers must have a minimum of 1 year of drill helper experience.
- Rig use history (the last 12 months) – the Subcontractor shall furnish certification stating that **either** the drilling rigs have not been previously used at a hazardous waste facility or identifying at which hazardous waste sites they have been used, the hazardous constituents to which they were exposed, and the decontamination procedures used following completion of the work.
- Description of drilling techniques for the tasks described in this specification.

3.2 Equipment Requirements

A short list of equipment necessary to perform the tasks discussed in this specification is provided in this section. The associated INEEL requirements for this equipment are also discussed. In addition to these items, all drilling and maintenance tools, materials, and equipment not herein designated, but normally required for the operation of drilling activities described in this specification must be provided, and be suitable for the actual conditions encountered. All equipment and materials so described are subject to inspection. Drill rigs and all downhole tools shall be free of dirt and grease upon arrival at TAN. All tools and equipment shall be onsite before startup.

1. Reverse Circulation Air Rotary Rig(s)

The rig(s) shall be a top truck mounted rig capable of both reverse circulation and conventional drilling. It must be capable of drilling, coring, and installing/removing all materials as described in this specification. The rig(s) shall be equipped to inject controlled amounts of water during the drilling process. The drill rig(s) shall be equipped with the maximum air filtration system available, 99.99% oil free and the drilling rig(s) shall have capabilities similar to a Drilltek D25.

- a. A thorough inspection of the rig prior to mobilization and prior to use must be performed. A verification of documents (i.e., rig inspection records, checklists) for this rig inspection shall also be performed with all deficiencies corrected in accordance with manufacturer specifications prior to operations.
- b. Each drilling rig shall have an operator with a valid Idaho well driller's license and driller supervisor valid in the State of Idaho (to be submitted as a vendor data submittal).
- c. Impermeable tarps or plastic sheeting (Visquene) shall be placed beneath drilling rigs to catch oil and hydraulic fluid leaks. A new plastic tarp will be used for each drilling site. Used tarps will be disposed of, unless otherwise specified.
- d. The drilling rig shall have a secondary air compressor on hand, capable of generating the same air flow as the primary air compressor used during drilling activities.

2. Air Compressors

All compressors must have in-line oil filters appropriately pressure rated to prevent oil from entering the borehole (99.99% oil-free air compressors).

3. Dust Suppression

Diversion systems to collect and carry cuttings, water, and dust away from the borehole a minimum of 9.14-m (30-ft) (discharge hose, cyclone separator, etc.) must be provided. Dust control activities shall comply with Idaho Administrative Procedures Act 16.01.01251 and 1252. The cyclone separator will require a support device when discharging onto a tarp and mounting hardware for a holding tank when discharging into a tank.

4. Drilling Water Containment

Secondary containment devices will be required at the well head to capture any water leaking from diverter seals or any other diversion system component and ensure that the groundwater does not reach the ground surface.

5. Fuel Tanks, Heaters, and Pressure Vessels

Any portable fuel tanks must be vented and labeled appropriately in accordance with the National Fire Code (NFC). Fuel tanks must be stored according to the National Fire Protection Association (NFPA) guidelines.

All propane gas heaters shall be equipped with a device to regulate and cut off the flow of gas during use in case of flame, failure, or rupture. All fuel tanks must be appropriately labeled with their contents and comply to applicable U.S. Department of Transportation

(DOT) regulations and 29 Code of Federal Regulations (CFR) 1926.150, prior to arrival onsite.

All pressure vessels must be code stamped certified and be current.

6. Tool Joint Lubricant

No petroleum-based lubricants are permitted during the drilling or completion operations, including petroleum-based hammer and drill pipe (joint) lubricants. Material safety data sheets must be provided by the Subcontractor for all potential lubricants according to requirements of GC-7C.3b.ii. Tool and drill pipe (joint) lubricants must consist of inert constituents.

7. High Pressure Steam Cleaner

Steam cleaners may be used to decontaminate equipment and material, as necessary.

8. Water Truck

Any equipment that is in violation of the manufacturer's specifications or regulatory requirements will be rejected.

4. GOVERNMENT FURNISHED EQUIPMENT

Materials and equipment furnished to the Subcontractor as government furnished equipment by the Contractor are identified in Schedule X. Any such materials required for use by the Subcontractor in performing the work described in the subcontract shall be furnished and delivered to the Subcontractor at no cost. All such materials will be made available to the Subcontractor at the drill site.

4.1 Schedule X

The Contractor will furnish to the Subcontractor, at no cost, the equipment or material listed in Table 4-1. The equipment or material will be supplied to the Subcontractor at the time of installation in accordance with the provision of the subcontract. Level D personal protective equipment shall be supplied by the Subcontractor and used according to the General and Special Conditions and as specified in INEEL/EXT-99-00020, "Test Area North Operable Unit 1-07B Final Groundwater Remedial Action Health and Safety Plan," (INEEL 2002b). Respirators shall be furnished by the Contractor for radiological and fugitive dusts as needed.

Items listed in Table 4-1 will be available only during normal working hours (Monday through Thursday, 7:00-4:30), and a 24-hour minimum advance notice to the Contractor (Saturdays, Sundays, and holidays excluded) will be required.

Table 4-1. Government furnished equipment and material.

Item	Quantity	Description	Location	Date Available
1	As needed	Respirators	Drill site	As needed
2	NA	Secondary containment for holding tank	Drill site	As needed
3	NA	Secondary containment materials for drilling area	Drill site	As needed

NA = not applicable

5. REFERENCES

INEEL, 2002a, *Interim Decontamination Plan for Operable Unit 1-07B*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-97-01287, Revision 4.

INEEL, 2002b, *Test Area North Operable Unit 1-07B Final Groundwater Remedial Action Health and Safety Plan*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-99-00020, Revision 2.

INEEL, MCP-226, "Well Construction/Well Abandonment," Idaho National Engineering and Environmental Laboratory, current issue.

